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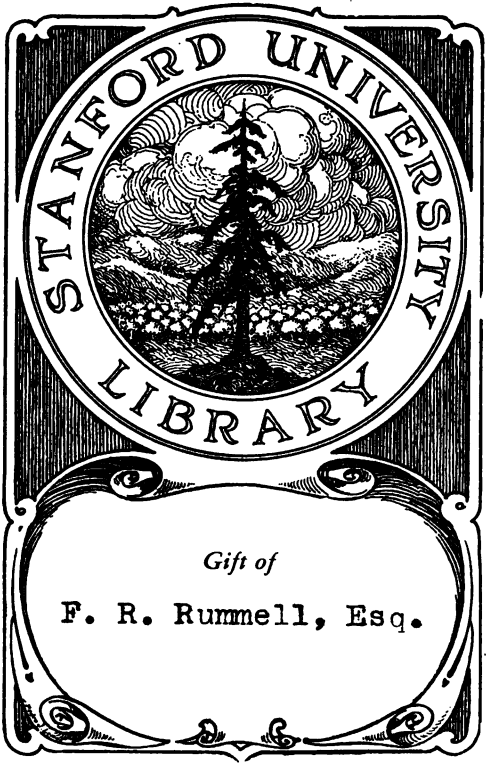

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MEMORANDUM.

Commanding officers of units of the tactical chain of coast artillery command will submit to the Chief of Artillery any suggestions relative to these Provisional Drill Regulations for Coast Artillery which they believe will add to their value.

J. C. BATES,
Lieutenant-General, Chief of Staff.

DRILL REGULATIONS

FOR

COAST ARTILLERY,

UNITED STATES ARMY.

(PROVISIONAL.)

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OFFICE OF CHIEF OF STAFF.

WAR DEPARTMENT,
OFFICE OF THE CHIEF OF STAFF,
Washington, February 28, 1906.

These Provisional Drill Regulations for Coast Artillery shall be strictly observed to the full extent existing equipment permits.

BY ORDER OF THE SECRETARY OF WAR:

J. C. BATES,
Lieutenant-General, Chief of Staff.

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DRILL REGULATIONS FOR COAST ARTILLERY.

(PROVISIONAL.)

GENERAL PRINCIPLES.

1. *Coast defense* comprises the military and naval dispositions and operations necessary to resist a naval attack on any part of a coast line.

2. The *line of defense* is the coast line; it consists of fortified and unfortified portions. The fortified portions are those which include important harbors, cities, roadsteads, estuaries and approaches thereto; the unfortified portions are those lying between or adjacent to the fortified portions.

3. The defense of a coast line involves the employment of both land and naval forces.

The defensive works ashore within the fortified portions are called *fixed defenses*.

Vessels of all kinds used for defensive purposes are called the *floating defenses*.

4. The floating defenses consist of:

Coast-defense ships (monitors, gunboats, etc.).
Scout ships.
Torpedo boats.
Submarine boats.
Patrol and picket boats.

Coast-defense ships are necessary to supplement the shore defenses at those points where the latter do not give adequate protection, by reason of the width of the approaches or the nearness of the harbor, city, or anchorage, etc., to the sea.

Scout ships are necessary to patrol at a distance offshore, to discover the approach of the enemy and to signal the information thereof to the signal stations ashore.

Torpedo boats are necessary for each important fortified point, to meet and repel attacks which may be made by the enemy's torpedo boats on the shipping at anchor inside the line of the fixed defenses, and to attack the large ships of the enemy whenever opportunity may offer.

Submarine boats are necessary to maneuver outside the mine field against large ships of the enemy prior to and during the attack, and to protect the mine field against subwater attack by the submarines of the enemy.

Patrol boats are necessary, during fog and thick weather, to guard the mine field and such independent mine groups as are not covered by shore defenses; also, at night, to patrol the approaches within the battle area with the object of preventing the small craft of the enemy stealing into the inner waters, under cover of darkness or the land shadows. In case searchlights are occulted or fail, the boat patrol is the only means available to discover any movement of the enemy at night and to give the alarm.

Picket boats are stationed outside the battle area to watch for the enemy and give warning of his approach.

5. The means of defense employed in connection with the fixed defenses are:

The fixed armament.
The movable armament.
Submarine defenses, including—
    Submarine mines,
    Mobile torpedoes,
    Marine obstructions, and
    Submarine boats.
Accessory artillery material.
The various *works, buildings,* and *grounds* required for the emplacement, the installation, the storage, care, and use of the foregoing material, and the accommodation of garrisons.

6. *The fixed armament* consists of guns and mortars of various sizes and powers, mounted on stationary carriages, including:

The primary armament (6-inch, 8-inch, 10-inch, and 12-inch guns and 12-inch mortars).

The secondary armament, medium-caliber guns (4-inch, 4.72-inch, 5-inch); small-caliber guns (1-pounder, 6-pounder, and 3-inch) when on fixed mounts; machine guns when on fixed mounts.

Each of these classes has its special rôle in coast defense. Large-caliber guns are designed to perforate heavy side and turret armor, and also to carry large explosive shell charges into the interiors of war ships. Large-caliber mortars are designed to attack the decks of war ships and to carry large explosive charges below the armored deck. Six-inch and medium-caliber guns are designed to defend the outer limits of the mine field against boat attack, to have power sufficient to attack lightly armored or unarmored ships; they are rapid-fire guns. Small-caliber guns are designed to defend the mine field and inner waters against the smaller boats, to attack the upper works and fighting tops of war ships and to search the gun ports of the large-caliber guns at short range; they are arranged for automatic or semiautomatic rapid fire. Machine guns are designed to be used against the personnel of war ships or of landing boats.

7. *The movable armament* consists of small-caliber guns, including automatic or semiautomatic rapid-fire guns and machine guns on wheeled mounts. It is designed for use either within the permanent works or batteries themselves to intensify the fire at any important point, to defend the mine fields, and to attack lightly armored or unarmored vessels; or, outside the permanent works, frequently in temporary works, for similar purposes, and also to resist boat attacks, to protect landing places, and to supplement from selected positions the artillery defense of the land fronts.

8. Guns and mortars of the fixed armament are, as a rule, mounted for service in groups of two or more of the same kind, caliber, and power. Such groups are called *batteries*. The term *battery* includes not only the work itself with its slopes, guns, platforms, ammunition hoists, galleries, rooms, corridors, passages, and magazines, but also all material installed in the work or used in connection with the service of the pieces, the position-finder stations provided therefor, and the personnel assigned to the work and its appurtenances.

The fixed armament should be so disposed as to admit of concentration and dispersion of fire throughout the areas which it is designed to cover.

9. *A submarine mine* consists of an explosive charge and a firing device, inclosed in a water-tight case or cases, and intended to be fixed in position under water in a channel which it is desired to close against the passage of an enemy's vessels.

Submarine mines are classified as mechanical and electrical. The former are exploded by means of a mechanical firing device; the latter by electricity.

Electrical mines are of two general classes, controllable and noncontrollable.

Mechanical mines and noncontrollable electrical mines are intended to be fired only by the blow of a passing vessel, and once they are fixed in position they are dangerous alike to both friend and foe; controllable electrical mines are operated by means of cables from a distance, and may be so controlled as to permit friendly vessels to pass over them in safety but bar the way to hostile ships.

Controllable electrical mines are classified as buoyant and ground. The latter are intended to rest upon the bottom of a channel, and to be used in water so shallow that hostile ships passing over them will come within their destructive radius; the former are intended to be floated at such a depth that they will be struck by the hull of a passing ship, and to be used in water too deep for ground mines.

10. *A mobile torpedo* consists of an explosive charge and a firing device, inclosed ordinarily in a cigar-shaped metal case, and intended to run under water and attack the hull of an enemy's vessel.

Mobile torpedoes are of two classes, dirigible and automobile. The former after being launched are controlled by means of electrical or other cables; the latter carry their own propelling agent, and once launched on a given course, keep the direction automatically. Many different types of dirigible torpedoes have been devised and experimented with, but all have practically given place to the latest type of the automobile torpedo which is now carried on nearly every modern war vessel and fired from either an above-water or under-water launching tube. This torpedo is also used as an adjunct to fixed mines, to cover waters of channels too deep and too swift to mine, in which case it is usually fired from an above-water launching tube located on a shore station.

11. *Marine obstructions* consist of sunken hulks, subwater piles, dams, booms, barricades, rope entanglements, and, generally, any form of barrier that may be used to delay the enemy in navigating a defended area.

12. *Accessory material* includes all instruments, equipments, appliances, devices, and supplies required for the proper installation, care, preservation, and service of the means of defense employed by coast artillery.

13. Coast artillery material may be classified in a general way under four heads, namely:

The armament, including guns, mortars, carriages, ammunition, fuses, primers, sights, quadrants, implements, and equipments.

The range equipment, including position finders, observing instruments of all kinds, plotting and relocating appliances and devices, range indicators, telephones, telautographs, or other means of transmitting information and data in connection with range and position finding and announcing or posting range or position data at the guns.

The power and light equipment, including engines, dynamos, storage batteries, motors, electric and other kinds of lights, and all material and supplies pertaining thereto.

The submarine defense equipment, including submarine mines, torpedoes, and obstructions, and all material pertaining to the placing and service of these means of defense.

14. The personnel of coast artillery is charged with the care and service of the material enumerated in the last paragraph. For this purpose it is organized into units and subunits for administration and fighting. The administrative units include those necessary for the proper housing, clothing, feeding, instructing, disciplining, and keeping the records of individuals and units. These units are prescribed by law, Army Regulations, and orders. Fighting units are designated *tactical units.* These are the units which have been found to be essential for the highest efficiency in action. They are prescribed by Army Regulations, orders, and the Drill Regulations for Coast Artillery. The tactical units, taken together, constitute what is called the *tactical chain of coast artillery command.*

15. The units of the tactical chain of coast artillery command are:

The artillery district.
The battle command.
The fire command.
The battery.

These units, the commanding officers thereof, and the water and land areas covered by the armament employed in connection therewith, respectively, are designated and defined as follows:

16. An *artillery district,* as a tactical unit, is a subdivision of the coast line, including the personnel assigned to duty in connection with the fixed defenses thereof.

The *district commander* is assigned in orders from the War Department.

17. A *battle command* includes the armament that covers a water area within which a naval attack may be expected and over which one man may exercise efficient control of the artillery fire action that may take place therein, together with all material accessory to the service of the armament, the personnel assigned thereto, and the submarine defenses connected therewith. There may be more than one battle command in an artillery district.

The *battle commander* is assigned in orders from district headquarters.

The water area covered by the armament of a battle command is designated a *battle area.*

18. A *battery* is a group of guns or mortars of the same caliber and power with the position-finder stations provided therefor and with the personnel assigned thereto. Under exceptional circumstances a single isolated gun, with its station and personnel, may constitute a battery.

The senior artillery officer on duty with the battery commands it and is designated the *battery commander.*

The water area covered by the armament of a battery is designated a *battery field of fire.*

19. A *fire command* consists of two or more batteries, not in general exceeding four, so located that their fire covers the same or contiguous water areas and that they can be readily commanded in action by one man.

The *fire commander* is assigned in orders from district headquarters.

The water area covered by the armament of a fire command is designated a *fire area.*

20. A *mine command* consists of such portions of the submarine defenses and rapid-fire guns for the protection thereof as may be efficiently controlled by one man. There may be more than one mine command in a battle area.

The *mine commander* is assigned in orders from district headquarters.

The water area in which the mines pertaining to a mine command are planted is designated a *mine field.*

21. *Fire control* includes the exercise of all such technical and tactical functions of command, supervision, control, and direction as may be necessary to insure an efficient defense.

27. He has, under higher authority, complete command of the artillery defenses of his district and so directs all of the artillery elements of defense that they may work harmoniously together and mutually support or supplement each other when possible.

28. He commands all troops of other arms of the service assigned to duty in connection with the fixed defenses.

29. He has a headquarters between which and the stations of his battle commanders communication is established, and at which he leaves a member or members of his staff when he himself quits it. He quits his headquarters whenever it becomes necessary for him to do so in the exercise of his command of the artillery defenses and of the troops of other arms assigned to duty in connection with the fixed defenses.

30. He should have knowledge of the plans of the general defense of the coast line in the vicinity of his district and be instructed by the general officer commanding as to his duties in connection therewith.

The Battle Commander.

31. He commands, for tactical purposes only, the personnel of his battle command.

32. He is responsible to the artillery district commander for the tactical efficiency of his command.

33. He sees that the orders of the artillery district commander prescribing battle-command drills and other exercises are properly and uniformly carried out in his command.

34. He visits frequently each of his fire commands, with a view to noting the condition of the material and the drill efficiency of the personnel thereof, and reports to the artillery district commander observed defects and deficiencies in supplies or equipments.

35. In battle-command drill and in action he exercises fire control throughout his battle command and over his battle area.

36. He will have the assistance of a *communication officer,* who has charge of the system of communications, transmits the orders of the battle commander, and receives all communications from the district, fire, and mine commanders.

37. He commands the fire action in his battle area from his station, from which the whole battle area and the approaches thereto should be visible.

38. He must have a full knowledge of the nature and position of the mines and obstructions in his battle area and be in communication with his mine commanders.

39. The *searching lights* assigned to his battle area must be under his immediate control.

40. He must be in direct communication with each fire commander of his battle command and with the headquarters of the district commander.

41. He must be informed by the district commander of the defensive dispositions made to protect the flanks and rear of his command, in case of an attack by a landing party, and his duties in connection therewith.

42. He will retain in his hands as long as possible the command of the fire action. He will assign such targets to fire commanders as he may think advisable for the most efficient defense. He will order independent fire action by fire commanders whenever in his opinion the time is opportune therefor.

The Fire Commander.

43. He commands, for tactical purposes only, the personnel of his fire command.

44. He is responsible to his battle commander for the tactical efficiency of his command.

45. He should keep himself constantly informed as to the condition of the material of his command and as to the sufficiency of all supplies.

46. He should test daily, or as often as practicable, during all seasons, the efficiency of the personnel and communications of his command by fire-action drill or by other methods.

47. His station is in direct communication with each battery commander of his command and with his battle commander.

48. At night and in night action he will, under orders of the battle commander, control the particular searchlight or searchlights assigned as illuminating lights for his fire area, and he is responsible to the battle commander for the efficient use of these lights.

49. In battle-command drill or in action he takes up promptly the attack of the targets assigned to him by the battle commander. When ordered by the battle commander to assume the exercise of independent fire action, he fights the batteries of his fire command in accordance with his own judgment as to what action is best. He orders independent battery action whenever, in his opinion, the conditions of the naval attack render such action advisable, provided independent fire-command action has previously been ordered by the battle commander, or emergency renders it necessary.

50. He will have the assistance of a *communication officer,* who has charge of the system of communications, transmits the orders of the fire commander, and receives all communications from the battle and battery commanders.

51. In exercising fire control he will use his own discretion as to orders of fire and rate of fire, unless these, either or both, have been prescribed by the battle commander. In independent action he is not restricted in the exercise of fire command.

The Mine Commander.

52. He exercises both administrative and tactical command.

53. As an administrative officer it is his duty to have his command supplied with all material necessary for carrying out the approved scheme of submarine defense.

54. As a tactical officer he is responsible to his battle commander for the condition of the submarine defense material of his command, and the efficient service thereof at drill and in action. He is particularly responsible for the instruction of the officers and enlisted men of his command in all matters pertaining to the care and use of the submarine defense material.

55. He should have for mine work proper the assistance of at least four officers; one at the mining casemate, called the *casemate officer,* one at the mine primary station, called the *range officer,* and two in charge of laying and maintaining the mine field, called the *mine-field officers.* After the mines are laid the senior mine-field officer will act as assistant mine commander, and the junior will be charged with the maintenance of the mine field.

56. At night and in night action he will, under orders of the battle commander, control the particular searchlight or searchlights assigned to cover the mine field, and is responsible to the battle commander for the efficient use of these lights.

57. At drill and in night action his normal station is in the mine primary station, which is in communication with the battle ommander's station. When he finds it necessary to leave this station the range officer will be his representative during his absence. This officer will at once take action on all orders received from the battle commander and keep the mine commander informed of their purport.

58. In battle-command drill or in action he undertakes to destroy such vessels crossing the mine field as the battle commander directs. When ordered by the battle commander to exercise independent command, he fires his mines in accordance with his judgment.

The Battery Commander.

59. He exercises both administrative and tactical command.

60. As an administrative officer he is responsible that every effort is made to keep his battery supplied with proper equipments, implements, and reserve ammunition.

61. As a tactical officer he is responsible to his fire commander for the condition of the artillery material of his battery and for the efficient service thereof in drill or action. He is particularly responsible for the instruction of the officers and men of his battery in the knowledge of the coast-artillery material pertaining to the battery, and in the care, preservation, and use of the same.

62. In battle-command or fire-command drill or action he exercises limited fire control, executing only those orders which come to him from the higher commanders. When independent battery action is ordered he will exercise independent fire control and will fight his battery in accordance with his own judgment.

In case of emergency, battery commanders will act without waiting for orders, in accordance with instructions previously given.

63. At drill and in action the battery commander goes wherever his presence is necessary; but upon quitting his station he leaves instructions as to where he may be found.

64. He will have the assistance of at least two officers, one at the guns, called the *battery officer,* and one at the battery primary station, called the *range officer.* At a mortar battery there is an officer in charge of each emplacement called the *emplacement officer,* but no battery officer.

65. The battery officer or the emplacement officer is the battery commander's assistant at the guns, and in the battery commander's absence from the vicinity of the guns is his representative in the discharge of all duties at the guns.

66. The range officer commands the battery range section, and his station is at the battery primary station. He is responsible to the battery commander for the condition of the material pertaining to the position-finding service, for the instruction of the range section, and for the efficiency of the position-finding service.

In battle-command or fire-command drill or action he receives directly from the fire commander, and executes, orders as to the assignment of targets, and when direct communication between the fire commander and the battery commander is impracticable he receives directly, and executes, other orders pertaining to the fire action of the battery, and he is responsible to the battery commander for the prompt and accurate transmission to the battery commander of all orders received by him directly from the fire commander.

67. Each emplacement of a gun battery of the primary armament, all emplacements of a battery of the secondary armament, and each pit of a mortar battery is commanded by a noncommissioned officer, called a *gun commander.*

68. The gun commander is responsible to the battery commander for the condition of the material and the efficiency of the personnel of his command.

69. At drill and in action his station is on the gun platform, but he goes wherever his presence is needed.

The Searchlight Officer.

70. The searchlights assigned to cover a battle area, and the manning party assigned to the service of these lights, are under the command of an officer who is called the *searchlight officer.* His station is at the battle commander's station or within speaking distance of the battle commander. He is responsible to the battle commander for the condition of the searchlight material and for the efficiency of the searchlights. At night drill and in night action he stands ready to execute the orders of the battle commander as to searching the battle area.

71. Lights specially intended to cover the mine field will ordinarily remain under the control of the mine commander for use in case of an attack on the mine field, but, when the battle commander deems it necessary to use a mine-field light for searching, such light will temporarily be under control of the searchlight officer.

GENERAL ORGANIZATION.

In accordance with the foregoing general principles the personnel of an artillery district, for efficient war service, should be organized as follows:

Personnel of an Artillery District Headquarters.

72. District commander, adjutant, quartermaster, ordnance officer, artillery engineer, and the necessary enlisted force, including assistants' clerks, orderlies, master electrician, telegraph operators, signalmen, etc.

Manning Party of a Battle Commander's Station.

73. Battle commander, assistant battle commander, communication officer, searchlight officer, and the necessary enlisted force, including observers, plotters, operators, and orderlies.

Since this station must be constantly manned day and night during the entire period of hostilities, two reliefs are absolutely necessary for efficient service, except in the case of the battle commander and his assistant.*

Manning Party of a Fire Commander's Station.

74. Fire commander, assistant fire commander, communication officer, and the necessary enlisted force, including observers, plotters, readers, operators, and orderlies.

Since this station must be continuously manned day and night during the entire period of hostilities, two reliefs are absolutely necessary for efficient service, except in the case of the fire commander and his assistant.*

Manning Party of the Submarine Defense of a Battle Command.

75. Mine commander, mine-field officers (the senior of whom will be assistant mine commander after the mines are planted), range officer, casemate officer, battery commanders and battery officers of rapid-fire batteries assigned to a mine command, planting section, loading section, range section, power and searchlight section, and gun sections.

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*There are a few interior fortifications where two full reliefs for each station will not be required.

Manning Party of a Battery.

76. Battery commander; battery officer (at the battery); range officer, at primary station; a range section for each battery of the primary armament, and a gun section for each gun of the primary armament and for each battery of the secondary armament.

For efficient service during hostilities two reliefs are necessary for the range section.*

Manning Party for the Searchlights of a Battle Command.

77. Searchlight officer and as many assistants as may be necessary, depending upon local conditions, and the enlisted force necessary for the service of lights, including electricians operators, controllers, linemen, etc.

Electrician Detachment for Each Artillery District.

78. Master electrician, electrician sergeants, and assistants.

DEFINITIONS.

79. The following are the definitions of terms relating to component parts and accessories of a modern seacoast battery:

Battery.—The entire structure erected for the emplacing, protection, and service of one or more cannon.

Emplacement.—That part of a battery pertaining to the position, protection, and service of one gun or mortar or a group of mortars.

Pit.—That part of a mortar emplacement designed for mounting one or more mortars.

Parapet.—That part of a battery which gives protection to the armament and personnel from front fire.

Interior crest.—The line of intersection of the interior wall or slope with the superior slope.

Traverse.—The structure perpendicular or oblique to the parapet wall, protecting the armament and personnel from flank fire.

Gun platform.—That part of the battery upon which the gun carriage rests.

Counterweight well.—The pit in a gun platform for the reception of the counterweight of a disappearing carriage.

Loading platform.—That surface upon which the cannoneers stand while loading the piece.

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* There are a few inferior fortifications where two full reliefs for each station will not be required.

Truck platform.—If the ammunition trucks run on a different surface from that of the loading platform, this surface is called the truck platform.

Banquette.—The step between the truck and loading platforms used in the transfer of ammunition.

Superior slope.—The top slope of the parapet or traverse.

Apron.—That portion of the superior slope of a parapet and the interior slope of a pit designed to protect against blast.

Exterior slope.—The outer slope of the battery.

Interior slope or wall.—The inner slope or wall of gun parapets or mortar pits.

Traverse slope or wall.—The side slope or wall of the traverse.

Rear slope.—The rear slope to the parade.

Corridor.—The elevated passageway, in rear of a traverse, connecting adjacent gun positions.

Corridor wall.—The traverse wall along the corridor.

Gallery.—Any passageway covered overhead and at the sides.

Parade slope or wall.—The rear slope or wall of the emplacement.

Battery parade.—The place in rear of the emplacements where the detachments form.

Parados.—A structure in rear of the battery for protection against fire from the rear. It may have an interior, superior, and exterior slope.

Ramp.—An inclined plane serving as a means of communication from one level to another.

Approaches.—Roadways entering the battery parade.

Observing station.—A protected position constructed in the parapet or traverse for the purpose of observation.

Booth.—Any recess or construction for the accommodation of telautograph, telephone, etc.

Magazine.—The rooms and galleries for the storage of ammunition.

Cartridge room.—The room of the magazine for the storage of cartridges.

Shell room.—The room of the magazine for the storage of projectiles.

Shot gallery.—The gallery of the magazine for the storage of projectiles.

Ammunition hoist.—The device by means of which ammunition is raised from the magazine to the loading platform.

Receiving table.—The hoist table on which the ammunition is placed preparatory to raising.

Delivery table.—The table on which ammunition is delivered from the hoist.

Reserve table.—A table in a sheltered position for reserve ammunition.

Trolley.—A mechanical device for transporting projectiles on horizontally suspended tracks.

Crane.—A mechanical device for raising ammunition by means of differential or other blocks.

In addition to the above there will be the various rooms of a battery designated by their uses, as storeroom, guardroom, tool room, etc.

80. *Water front.*—That portion of the defenses bearing upon the navigable water areas that may be open to an enemy.

81. *Land front.*—That portion of the defenses which is provided to repel an attack from the land area in rear of or on the flank of permanent seacoast works.

82. *Fortified point.*—A general term indicating a city, harbor, anchorage, estuary, or any limited portion of the coast line that is defended by fixed defenses.

83. *Searchlight area.*—The area of land or water illuminated by a searchlight.

84. *Searchlight range.*—The distance at which a target can be illuminated sufficiently for range finding and identification purposes.

85. *Manning party.*—The personnel assigned to the service of any particular unit of coast-defense material.

86. *Manning table.*—A list of the names of those who constitute a manning party with the particular posts to which they are assigned.

87. *Coast-artillery fort.*—The coast defenses at any military post and the coast-artillery garrison assigned thereto.

The command of a coast-artillery fort devolves upon the senior officer of coast artillery present.

88. *Artillery garrison.*—The personnel assigned to duty at a coast-artillery fort.

89. *Cannon.*—Artillery weapons not carried nor fired in the hands, from which projectiles are thrown by the force of expanding powder gases.

90. Cannon are of three classes:

Guns, in which the length of the bore is great in comparison with the caliber,

Mortars, in which the length of the bore is small in comparison with the caliber.

Howitzers, those cannon whose relative length and caliber place them between the other two classes.

The term gun or piece is used when referring to any class of cannon.

91. Cannon of the United States land service are classified, according to their use, into *mountain, field, siege,* and *coast artillery.*

92. *Rapid-fire guns.*—Single-barreled breech-loading guns provided with breech mechanisms, mountings, and facilities for loading, aiming, and firing such that they may be fired with great rapidity. The breech mechanism is operated by a single motion of the handle or lever. Metallic cartridge cases are used except in some of the larger calibers. The smaller calibers use fixed ammunition, i. e., the cartridge case and projectile are permanently fixed together. In the larger calibers the projectile is separate.

93. *Machine guns.*—Guns of one or more barrels using fixed ammunition and provided with mechanism for continuous loading and firing. The mechanism may be operated by man power or by the force of recoil.

94. Guns in which the force of recoil is used to operate the breechblock are termed *semiautomatic.*

When this force is also used to load and fire the guns they are termed *automatic.*

95. Cannon are made of a single piece or are built up of two or more pieces.

Built-up cannon are of two general classes:

The first class is composed of steel forgings, in which a tube extends throughout the length of the bore, with superposed concentric forgings of as great length as can be economically utilized, and of such thickness as may be determined by considerations of economy of construction and of the elastic strength of the component parts.

The second class is constructed on an inner tube, with the remainder of the wall composed entirely, or in part, of a rectangular, circular, or ribbon form of wire.

Built-up cannon are designed to utilize, to the best advantage, the elastic qualities of the metal. No portion should be strained beyond the elastic limit during firing. As the greatest strain is at the surface of the bore, this portion of the wall is compressed, when at rest, up to its elastic limit, and it is extended, when under the pressure of the powder gases, nearly or quite up to its elastic limit.

Elastic limit is the greatest stress which, applied to a body, will not produce a permanent strain—that is, a permanent set.

In a cannon made of a single piece of homogeneous steel with no initial compression or extension the metal at the surface of the bore can not be stretched, by the expansion of the powder gases, beyond the limit of elasticity without permanent deformation taking place. If, however, a cannon of the same dimensions be made of concentric tubes properly assembled, so that the metal at the surrace of the bore is compressed to its elastic limit, this surface will, in firing, stand a corresponding stress necessary to stretch it back to the normal condition of the first cannon, and thereafter, it may be further stretched so as to utilize the elastic qualities for extension. Hence a built-up cannon may be made stronger than a cannon of the same dimensions composed of a single piece having the same quality of metal.

96. The tangential or hoop strength of a cannon is the resistance which it offers to being torn apart in a plane containing its axis.

97. The longitudinal strength of a cannon is the resistance which it offers to being torn apart in a plane at right angles to its axis.

98. Modern cannon, excepting machine guns, are generally of the built-up forged-steel type. These are composed of an inner tube with superposed jacket and hoops.

99. The *tube,* ordinarily made in one piece, constitutes the nner wall of the bore from breech to muzzle.

100. The *jacket* is a cylindrical forging concentric with and shrunk on the tube; it generally extends from the breech to a plane beyond the trunnions.

101. A *hoop* is a cylindrical forging concentric with the tube superposed upon the tube, jacket, or other hoops. The *"C" row* is in contact with the tube in front of the jacket.

The *"A" row* is over the jacket, extending from the breech to the trunnions; *"B" row,* when used, is on *"A" row,* and the *"D" row,* on the *"C" row,* in front of the trunnions.

102. The *breech* of the gun is the mass of metal behind the plane of the bottom of the bore.

103. The *face of the breech* is the rear terminal plane of the gun perpendicular to the axis of the bore.

104. The *breech reenforce* is the part of the body of the cannon in front of the breech and in rear of the trunnion band.

105. The *trunnion band* is the hoop of which the trunnions form a part, located at about the center of gravity of the gun.

106. The *rimbases* are the masses of metal uniting the trunnions with the trunnion band. The *faces* of the rimbases are the end planes perpendicular to the axis of the trunnions.

107. The *trunnions* are cylinders designed to rest in bearing surfaces of the carriage, called trunnion beds, the axis being perpendicular to the axis of the bore, and ordinarily in the same plane. They connect the gun with the carriage and transmit the force of recoil from one to the other. The faces of the trunnions are the end planes perpendicular to the axis of the trunnions.

108. The *center of gravity* of a cannon is near the intersection of its axis and the axis of the trunnions. The preponderance is the excess of the moment of weight in front of the axis of the trunnions over that in rear, or the converse.

109. The *chase* is the part in front of the trunnion band.

110. The *swell of the muzzle* is the enlargement of the exterior of the gun at the muzzle.

111. A *fillet* is that portion of metal filling the re-entrant angle formed by two surfaces not tangent, thus avoiding the sharp corner. The term is also sometimes applied to the metal cut away in removing the sharp edge formed by the intersection of two surfaces.

112. The *bore* is the interior of the cannon in front of the breech mechanism. It is composed of the powder chamber, the forcing cone, and the main bore.

113. The *powder chamber* is composed of a main chamber (usually cylindrical, but frequently conical, and sometimes elliptical) and a conical part, the *centering cone,* uniting it with the forcing cone.

The centering cone serves to bring the axis of the projectile to the axis of the bore. The copper rotating band on the projectile, when seated in this cone, stops the projectile at the proper position.

114. The *forcing cone* is immediately in front of the centering cone and is formed by cutting the lands entirely away at its rear end and to a less extent toward the front end where the lands attain their full height.

The object of this cutting away of the lands is to reduce the power necessary at first to force the rotating band over the lands.

115. The *main bore* is that part of the bore in front of the forcing cone.

In order to give rotary motion to the projectile, spiral grooves are cut in the surface of the bore; the rib of metal between two adjacent grooves is called a *land*.

By *twist of rifling* is meant the inclination of the grooves at any point to the axis of the gun. When this inclination is constant the twist is said to be *uniform;* when it increases gradually from the breech, the twist is said to be *increasing.* Twist is generally expressed in terms of the caliber, viz, one turn in 40 calibers, etc., meaning that the projectile makes one complete turn in passing over a length of the bore equal to 40 calibers, etc.

116. The *length of the bore* is the distance from the front face of the breechblock to the face of the muzzle.

117. The *muzzle* is the front end of the gun, including the mouth of the bore, the face, and the swell. The face is the terminating plane, at the muzzle, perpendicular to the axis.

118. The *travel* of the projectile is the distance from the base of the projectile in its seat to the muzzle of the gun.

119. The *charge* consists of the powder and the projectile. The powder in all guns, excepting machine and rapid-fire guns, is inclosed in silk or serge bags and is separate from the projectile. In guns of greater caliber than 6 inches it is put up in two or more sections.

120. *Breech mechanism.*—The mechanical device for opening and closing the breech.

121. *Breechblock.*—The metal plug which closes the breech.

122. *Breech recess.*—The part of the cannon which receives the breechblock.

123. *Obturator.*—Any device for preventing the escape of gas. This term includes the entire mechanism.

124. *Gas check.*—The essential mechanical feature of an obturator which enables it to prevent the escape of gas.

125. *Vent.*—A small channel leading from the exterior to the powder chamber for ignition of the powder.

126. *Loading tray.*—A device used while loading to protect the breech recess.

127. *Caliber of the gun.*—The diameter of the bore in inches at the top of the lands. It is the minimum diameter of the rifled portion of the bore.

128. *Axis of the gun.*—The axis, or central line, of the bore.

129. *Axis of the trunnions.*—The central line of the trunnions.

130. *Carriage, or mount.*—The means provided for supporting a gun or mortar in firing. It includes the means for giving elevation and direction, for taking up the recoil on discharge, and for returning the gun or mortar to the firing position.

131. *Fixed mount.*—A mount provided for guns and mortars in permanent works and not designed to be moved from place to place.

132. *Movable carriage, or wheeled mount.*—A carriage or mount provided with wheels for ready transportation of the piece mounted thereon.

133. *Coast carriages.*—Coast carriages, or mounts, are classified:

- (1) According to the nature of the cover afforded by the emplacement, into—
  - (*a*) *Barbette,* where the gun fires over the parapet.
  - (*b*) *Casemate,* where the gun fires through a port.
- (2) According to the location of the pintle, into—
  - (*a*) *Front pintle,* where the axis of rotation is at or near the front end of the carriage.
  - (*b*) *Center pintle,* where the axis of rotation is approximately through the center of the carriage.
- (3) According to the area of fire, into—
  - (*a*) *Limited fire.*
  - (*b*) *All-round fire.*

Barbette carriages are either *disappearing* or *nondisappearing.*

Disappearing carriages are classified into—

- (*a*) *Disappearing proper,* where the gun is raised above the parapet for firing and recoils under cover.
- (*b*) *Masking mounts,* carriages by means of which the gun can be lowered below the crest of the parapet for concealment.
- (*c*) *Gun lift,* where the carriage proper is a simple barbette carriage mounted on a platform which is raised and lowered vertically by power.

Machine and *rapid-fire* guns used in coast defense are mounted:

(*a*) On *moving,* or *traveling,* carriages.

(*b*) On *fixed mounts,* called rapid-fire mounts, which are disappearing or nondisappearing, recoil or nonrecoil.

Carriages for the larger guns consist of the top carriage, the chassis and racer, the base ring, and the mechanism for elevating, traversing, hoisting the projectiles, and, in the case of the disappearing carriage, drawing the piece from battery.

The return of the gun in battery is effected:

(*a*) By *gravity* in the case of guns on the ordinary nondisappearing carriages, the chassis rails being given a sufficient inclination for this purpose.

(*b*) By *springs,* in the case of mortars and rapid-fire guns.

(*c*) By *counterweights,* in the case of the disappearing carriage.

134. *Trajectory.*—The curve described by the center of gravity of the projectile in passing from the muzzle to the point of impact.

135. *The theoretical range,* or the range of ballistic tables, is the horizontal distance from the muzzle of the gun to that point of the descending branch of the trajectory, called *the point of fall,* which is at the level of the muzzle of the gun. This definition of the theoretical range is strictly accurate and is conveniently applicable in using quadrant elevation; but in using sight elevation it is more convenient, assuming the principle of the rigidity of the trajectory, to define the theoretical range as the distance from the muzzle of the gun to the point of intersection of the trajectory with the line from the muzzle to the target, the distance being measured along this line. The point of intersection is called the point of fall.

The range, in gunnery, is specifically the horizontal distance from the muzzle of the gun to the target, but the word is applied in a general sense to other horizontal distances, as, for instance, to the distance between a position finder and the target, or between a position finder and a splash, etc.

The range of a shot is the horizontal distance from the muzzle of the gun to the point where the projectile first strikes. This point is called *the point of impact.*

The distances obtained in range and position finding are horizontal distances.

136. *Target.*—The object at which to aim, lay, or fire guns or mortars, as a boat, ship, or other object, whether stationary or moving.

137. *Line of sight.*—A straight line passing through the sights of the piece, which, in the act of firing, includes the target also.

138. *Plane of sight.*—The vertical plane containing the line of sight.

139. *Line of direction.*—A straight line from the center of the gun to the center of the target at the instant the shot strikes.

In gunnery this is considered as a horizontal line.

140. *Plane of direction.*—A vertical plane passing through the line of direction.

With a fixed target the plane of direction and the plane of sight practically coincide.

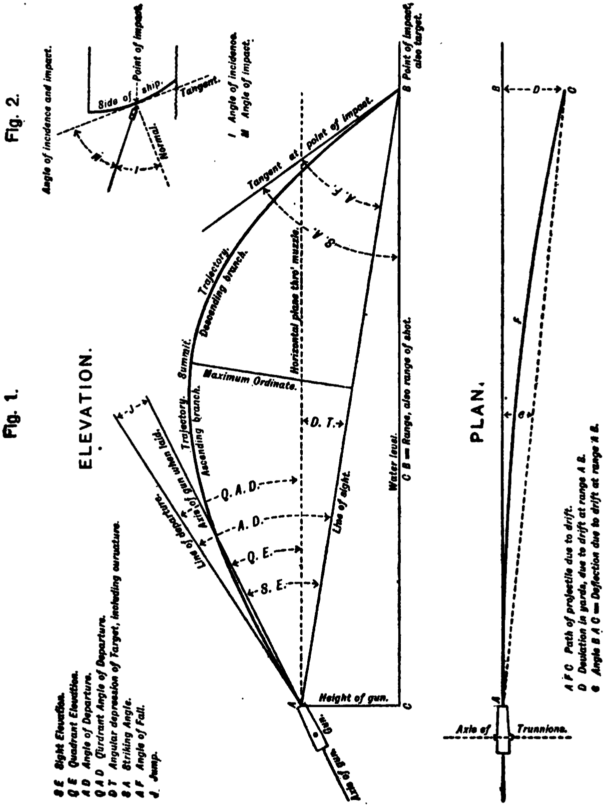


Fig. 2.

Fig. 1.

Angle of incidence and impact.
Side of ship.
Point of impact.
Tangent.
Normal.
I Angle of incidence.
M Angle of impact.
ELEVATION.
Point of impact, also target.
Tangent at point of impact.
Trajectory. Descending branch.
Summit.
Maximum Ordinate.
Trajectory. Ascending branch.
Horizontal plane thro' muzzle.
D. T.
Q. A. D.
A. D.
Q. E.
S. E.
A. F.
S. A.
J
Line of departure.
Axis of gun when laid.
Line of sight.
Water level.
C B = Range, also range of shot.
Height of gun.
Gun.
Axis of Gun.
A
B
C
S E Sight Elevation.
Q E Quadrant Elevation.
A D Angle of Departure.
Q A D Quadrant Angle of Departure.
D T Angular depression of Target, including curvature.
S A Striking Angle.
A F Angle of Fall.
J. Jump.
PLAN.
A
B
C
D
F
e
Axis of Trunnions.
A F C Path of projectile due to drift.
D Deviation in yards, due to drift at range A B.
e Angle B A C = Deflection due to drift at range A B.

141. *Elevation.*—A general term used to denote the inclination given to the axis of the gun in aiming or laying.

142. *Sight elevation.*—The elevation measured from the line of sight.

143. *Quadrant elevation.*—The elevation measured from the horizontal plane.

144. Quadrant elevation equals sight elevation when the target is at the level of the gun; when the target is above the level of the gun quadrant elevation equals sight elevation plus the angular elevation of the target; when the target is below the level of the gun quadrant elevation equals sight elevation minus the angular depression of the target.

The *angular elevation* or *depression* of the target includes the depression due to curvature of the earth. It is sometimes called the *position angle.*

145. *Line of departure.*—The prolongation of the axis of the gun at the instant the projectile leaves the bore; it is therefore tangent to the trajectory at the muzzle. It is sometimes called *line of fire.*

146. *Plane of departure.*—The vertical plane passing through the line of departure.

147. *Angle of departure.*—The angle between the line of departure and the line of sight. This is the angle given in range tables.

148. *Quadrant angle of departure.*—The angle between the line of departure and the horizontal plane.

149. *Jump.*—Experience has shown that the actual range for a given elevation does not correspond to the computed range. For convenience it is assumed that the entire discrepancy is due to an increase or decrease of the elevation of the gun at the instant the projectile leaves the muzzle, and this small difference in angle is called *the jump.* Therefore in determining the sight or quadrant elevation to be used to obtain a given range, a correction must be made, which differs for different classes of guns and carriages. It must be determined by experiment and therefore is not included in the angles of departure in range tables.

NOTE.—The jump for all modern guns and carriages has not yet been determined. In practice it is included in the necessary range corrections as determined by trial shots.

150. Quadrant elevation is obtained from the angle of departure by correcting for the angular elevation or depression of the target, including curvature of the earth, and for jump.

151. Sight elevation is obtained from the angle of departure by correcting for jump only.

152. The quadrant angle of departure is obtained from the angle of departure by correcting for the angular elevation or depression of the target, including curvature of the earth.

153. It is important that a clear distinction should be drawn and maintained in practice and reports between these several angles.

154. *Angle of fall.—The theoretical angle of fall,* or the angle of fall of ballistic tables, is the angle which the tangent to the trajectory at the *point of fall* makes with a line from that point to the muzzle of the gun.

But in practical gunnery the *angle of fall* is taken to be the angle which the tangent to the trajectory at the *point of impact* makes with a line from that point to the muzzle of the gun. The *angle of fall* is often expressed as a slope, i. e., 1 on 10.

155. *Striking angle.*—The angle which the tangent to the trajectory at the point of impact makes with the horizontal plane. It is equal to the angle of fall plus the angular depression of the point of impact.

156. *Angle of incidence.*—The angle which the tangent to the trajectory at the point of impact makes with the normal to the surface at that point.

157. *Angle of impact.*—The angle which the tangent to the trajectory at the point of impact makes with the plane tangent to the surface at that point.

158. *Muzzle velocity.*—The velocity of the projectile at the muzzle. It is sometimes called the initial velocity.

159. *Remaining velocity.*—The velocity at any given point of the trajectory.

160. *Striking velocity.*—The velocity of the projectile at the point of impact.

161. *Deviation.*—The divergence, in yards, of the projectile from the plane of departure at the range considered. This divergence in angular measure at the gun is called *deflection.*

These terms are used in this sense in range tables.

The term *deviation* is also used in artillery practice to indicate the divergence of the projectile from the plane of direction measured at the target at right angles to this plane.

The corresponding angular divergence is also called *deflection.*

162. *Drift.*—The divergence of the projectile from the plane of departure due to the rifling of the gun and to the ballistic character of the projectile. It is generally in the direction of the rotation. For our service rifled cannon it is to the right. It may be expressed either in yards or angular measure.

163. *Sight deflection.*—The horizontal angle between the line of sight and the axis of the piece. It is used to correct for conditions of drift, wind, and movement of target tending to cause deviation.

164. A piece has ***plus deflection*** when its axis points to the ***right***, and ***minus deflection*** when its axis points to the ***left*** of the target.

Fire right marked on the deflection scales of telescopic sights indicates plus deflection, and ***fire left*** minus deflection.

165. Range corrections are generally required on account of conditions of tide, wind, density of air, movement of the target, and jump.

166. When conditions require the use of a range ***greater*** than the actual range the correction is termed a ***plus*** correction, and when it requires the use of a range ***less*** than the actual range it is termed a ***minus*** correction.

167. In the position-finding service characterizing range corrections and deflections as plus or minus is avoided by the use of ***reference numbers,*** which are the numbers of the graduations on scales of which the natural origin, or absolute zero, is not at an extremity, but for which is adopted an arbitrary origin, or assumed zero, in the minus direction from the natural origin and separated from it by a number of graduations at least equal to the probable maximum minus correction.

168. *Danger space.*—The horizontal distance within which a target of given height would be hit by the projectile. It is usually computed for a standard size of target. When the danger space includes the entire range it is called a danger range. The danger space varies with the flatness of the trajectory, the height of the target, and the height of gun above the target.

169. *Recoil.*—The backward movement of the gun on firing. It is measured by the distance which some point of the gun or carriage moves during the recoil. ***Counter recoil*** is the return in battery of the gun immediately after firing.

170. ***Density of loading*** is the ratio of the weight of the powder charge to the weight of a volume of distilled water at a temperature of 39.2° F. which will fill the powder chamber. The formula for computing it is, $\Delta = \frac{27.70\tilde{\omega}}{C}$, in which $\Delta =$ the density of loading, $\tilde{\omega} =$ the weight of the powder in pounds, and $C =$ the volume of the chamber in cubic inches.

171. *Energy* of the projectile is the work stored up in the projectile by the force of the expanding gases generated by the explosion of the charge. It is usually expressed in foot-tons. The formula for computing it is, $E = \frac{wv^2}{2240 \times 2g}$, in which w is the weight of the projectile in pounds, v is the velocity in feet per second, and g the acceleration due to gravity, taken at 32.16 f. s., its mean value.

172. *Azimuth.*—The azimuth of a point from a second point is the horizontal angle between the south line through the second point and the straight line joining the two points, the angle being always measured from the south line as an origin toward or through the west, i. e., clockwise. Hence the azimuth of the west point from any point is 90°; the north point, 180°; the east point, 270°.

For the convenient and accurate relocation of targets in coast artillery, "the south line through the second point" is, as a rule, not a true south line, but only parallel to some true north and south line that has been adopted as a datum line.

173. *Displacement.*—The horizontal distance in yards from the vertical axis of the position finder of the battery primary station to the pintle center of the directing gun, or to some other directing point.

174. *Gun displacement.*—The horizontal distance in yards from the pintle center of the directing gun to the pintle center of any other gun of the battery, or from the directing point to the pintle center of any gun of the battery.

175. *Directing point.*—A point at the battery to which relocation is made from the primary station. When the pintle center of a gun of a battery is taken as the directing point, such gun is called the *directing gun.*

176. *Azimuth difference.*—The difference between two azimuths of the same point as read from two other points, as, for example, the difference between the azimuths of a target as read from a primary station and from a directing gun of a battery.

177. *Range difference.*—The difference in range of a point from any other two points, as, for example, of a target from a directing gun and from any other gun of a battery.

178. *Gun differences.*—Range and azimuth differences of a target from any gun due to its gun displacement.

179. *Indication of a target.*—Any method employed to assign a target.

180. *Identification of a target.*—Any process which enables a man to recognize a target indicated to him.

181. *Location of a target.*—The determination of its position; that is, its distance and azimuth from a given point.

182. *Relocation of a target.*—Any process whereby, having the location of the target from one point, its location from some other may be obtained without further observation.

183. *Position finding.*—The process by which the position of a target or ship is quickly located.

184. *Target or vessel tracking.*—That process whereby successive positions of a moving target are plotted on a chart or plotting board. It includes the observations made by the observers at the position-finding instruments, the plotting of the results of these observations on a plotting board and tracing thereon the plotted track of the course of the target.

185. *Observing interval.*—The time in seconds between two consecutive observations of a target during tracking.

186. *Predicted point.*—That point on the course of a moving target at which it is predicted that the target will arrive at the expiration of a certain interval of time from the time of the last observation on which the prediction is based. The interval of time is called the *predicting interval.*

187. *Predicted firing.*—Firing in which guns or mortars are given direction and elevation corresponding to a predicted point.

188. *Set-forward point.*—A point on the course of the target in advance of a predicted point at a distance from the latter equal to the distance passed over by the target during the time of flight of the projectile for that particular range.

189. *Set-back point.*—A point on the course of a target determined in a similar manner as the set-forward point, but in the opposite direction.

190. *Firing interval.*—The interval of time between consecutive rounds of the same battery in continuous firing.

191. *Pointing.*—The operation of giving the direction and elevation necessary to hit the target. When the sight is used it is called *aiming,* when the sight is not used it is called *laying.*

192. There are three methods of pointing:

Case I.—When direction and elevation are both given by the sight.

Case II.—When direction is given by the sight and elevation by the elevation scale, which may be graduated for quadrant angles or for the corresponding ranges in yards.

Case III.—When direction is given by the azimuth circle and elevation by the elevation scale.

DRILL.

GENERAL INSTRUCTIONS.

193. The instructor will place himself where he can be seen and heard by all in the detachment. His explanations will be given with life, in a distinct voice, the tone of which should not be monotonous. He will take great pains to train the gun commanders and gunners to practice giving commands, which should be quick and clear, but not louder than necessary.

The instructor will avoid uncommon expressions, long explanations, and details of manufacture. He will require each man to take by himself the position he is to occupy, at any stage of the drill, and will, when necessary, illustrate in detail how every operation should be performed.

Endeavor should be made to interest men in their work and to train them on such a system that they may thoroughly learn their duties with as little weariness to themselves, and as quickly as possible. It is desirable to get them, from the beginning, to drill with precision and without unnecessary noise.

The drill should be varied by short descriptions of the equipment, ammunition, fuses, etc.

Alertness of attitude, smartness of movement, and silence should be enforced throughout drill.

The post of a man when once assigned in the manning table will not be changed except for a good and sufficient reason; men must be made proficient in the duties of the posts to which they are assigned. (See pars. 312, 331, etc.)

194. Detachments will, as soon as possible, be practiced in actual loading with dummy cartridges and projectiles and pointing the gun as for service.

195. It is not necessary to instruct the detachment, especially when composed of recruits, in the exact order in which the drill is written. The instructor will use discretion in adopting a system by which the details of the drill can be readily taught.

196. All changes of position of cannoneers in serving the piece will be executed in double time.

197. On all occasions before giving the commands *load* and *fire* the number of the piece will be repeated.

With guns the command *fire* will never be given unless the gun is in battery, nor with mortars unless the piece has an elevation of at least 45 degrees.

198. At the command *take cover,* given at any time, all numbers not designated to remain at their posts will move at double time to some designated place under cover. As a rule this command will not be given, except in mortar batteries, and the cannoneers will remain at their posts or near them.

199. At the command *stand fast* the numbers will remain in the positions they are in until *go on* is given.

When one number makes a mistake, the command *stand fast* should be given and the error pointed out. When it can be avoided the command *as you were* should not be given to the whole detachment, but only to the number or numbers concerned.

200. *Diminished numbers.*—Disabled men are replaced from the reserve, then from the ammunition detachment when practicable; when this can not be done the number of guns in action will be diminished so that not more than one gun will be served with diminished numbers. The possibility of the gun commander, chief of detachment, and gunner being disabled should be provided for and their successors named.

201. All parts of the guns and carriages, the equipments, and implements should be carefully examined by the battery officer, emplacement officer, or range officer to see that they are serviceable and in working order. In general, special attention is given to:

Elevating and traversing devices.

Devices for running in and from battery.

Recoil cylinders, to see that they are filled with the proper amount of liquid and the plugs properly inserted, care being taken that no air cushions are formed while filling. A brass plate giving amount of liquid, and directions for filling and testing them, should be attached to the recoil cylinders of every mounting.

Obturators, to see if they are properly adjusted and pads in serviceable condition.

Throttling valves, to see that they are properly set.

Motor generator sets.

Motors and controllers.

Firing attachments.

Firing batteries and circuit should be tested.

Sights and means of giving quadrant elevation in adjustment.

Subscales of azimuth circles in adjustment.

Sponges of proper gauge.

Rammers provided with scales to indicate the seating of projectiles.

Hoists in working order

Instruments and appliances pertaining to the position-finding equipment must be thoroughly examined and tested and, if necessary, adjusted.

Tables, charts, etc., should be at hand and inspected to see if in good order.

Special points to be noted for each type of gun or mount will be found in the drill for that gun.

General instructions for the guidance of those in charge of magazines or ammunition stores, and for the employment of lamps for lighting magazines and passages must be strictly adhered to.

The above preparations will be especially necessary before practice.

202. There are three *orders of fire:*

1. *Restricted fire,* when the range, firing interval, or number of shots is specified. This may be by piece, by pit, or by battery.

2. *Unrestricted fire,* when the range, firing interval, and number of shots is not specified. This firing should be as rapid as is consistent with accuracy, using the necessary ballistic corrections.

3. *Fire at will,* when the firing is by piece, at short range, omitting ballistic corrections.

As a rule mortars are not fired by piece in action.

203. A *salvo point* is a point the range and azimuth of which are known, at which a concentrated fire from one or more batteries may be directed. Such fire is called *salvo fire.*

Certain points in a narrow channel are usually selected as salvo points, the ranges and azimuths of which are conspicuously posted in the battery.

204. *Powder.*—For artillery practice the cartridges of oldest date of manufacture will be expended first. Smokeless or brown prismatic powder marked for one caliber of piece must not be used for any other caliber or piece of different chamber capacity.

However carefully it is kept, powder will generally be found not to give the muzzle velocity marked on the cases. Before practice begins the muzzle velocity for each lot of powder to be used should be determined by trial shots.

205. *Projectile.*—Projectiles will be carefully cleaned before being inserted in the bore, the bourrelet, the swell just in rear of the head, being entirely free of paint. They should not be lubricated, as any lubricant accumulates sand and grit.

Shell and armor-piercing shot in the magazine are, as a rule, filled and fused.

206. *Time fuses.*—Fuses from three to four years old burn slowly and should be set about 10 per cent shorter than when new. The age of the fuse should be noted and those of one date selected for the practice, or at least for the same series.

207. *Loading.*—The battery commander will designate the kind of projectile to be used and it will continue to be used until he prescribes a different kind.

208. Before giving the command *load* the chief of gun detachment will name the kind of projectile to be used; when shrapnel is used he will prescribe the time of the fuse.

209. Care must be taken to prevent injury to the gas-check seat. It is imperative that the gas-check seat be kept clean. Sometimes the residue from the igniter of black powder drops from the obturator into the gas-check seat or the breech recess and requires to be wiped off.

210. It is important that the projectile be rammed home with force; it strikes the top of the bore near the end of the centering slope and may jam if it is not forced quickly up the slope.

In loading with fixed ammunition care will be taken that the point of the projectile does not strike.

211. Immediately after a piece is fired the breech will be opened, the chamber sponged with a dry sponge and, if a vented piece, the primer removed; all without command. Sponging is especially necessary with reduced charges and when no projectile is used, as in firing salutes. With pieces using metallic cartridge cases, sponging is omitted.

212. When a cartridge of reduced diameter is used it is necessary to place a stick or other material under the rear end of the cartridge to hold it central with the orifice in the vent.

213. In no case will the bore or chamber of the piece be washed out during firing.

Under no circumstances will water be used on the breech mechanism.

214. *Serving the vent* means removing the old primer, inserting a new one, adjusting the slide of firing attachment, attaching the firing wire or lanyard and clearing the vent.

215. It is seldom necessary to clear the vent except at *examine gun*, when all water, oil, and other obstructions must be removed.

The vent will not be cleared during firing unless it becomes obstructed. After clearing the vent the primer seat will be wiped clean.

In all cases care will be taken to avoid scoring the vent and the primer seat.

When the punch, gimlet, or reamer is used it will be introduced from the mushroom end of the vent.

216. A drill primer or a fired standard primer will always be used at drill.

217. Combination primers and button drill primers will, as a rule, be inserted while the breech is fully open, but when necessary, owing to the mechanism, primers may be inserted when the breech is closed.

The lanyard will not be hooked to the firing leaf or primer until the breech is closed.

218. *Ready* means, in Cases I and II, that the piece is loaded and may be fired when aimed; in Case III, that the piece is loaded and laid and may be fired.

219. *Missfires.*—Long *hang fires* are possible with smokeless powder. In case of a missfire in artillery practice the breech will not under any circumstances be opened for ten minutes, nor until the primer has been removed, except when the primer is seated in the cartridge case.

220. Before removing a primer wait a few seconds to see if there is a *hang fire*, and, if firing by electricity, break the circuit.

221. With percussion primer the breech will be opened with care, the cartridge removed and disposed of without shock or jar and replaced by another. If the firing device can be cocked by hand without opening the breech a second trial of the primer will be made before the cartridge is removed.

222. With electric primer seated in the cartridge case the cartridge will be removed and replaced by another.

223. With obturating primers seated in the vent a second primer will be tried; if two primers being discharged fail to ignite the charge the breech will be opened, the vent examined and cleared if necessary, the rear section of cartridge pulled a little to the rear (except in mortars) so that the mushroom head will push it to its place, the breech closed, and another primer tried.

224. *Cease firing.*—At the command or signal *cease firing* lanyards will be detached. If using electric primers the circuit will be broken. With rapid-fire guns using metallic cartridge cases the breech will be opened. With machine guns the mechanism will be put to *safe.*

225. If firing is not to be resumed, fixed ammunition and separate cartridges will be withdrawn. Projectiles *not loaded* and *fused* will be driven back and withdrawn. Separate projectiles *loaded and fused* will be left in the gun until a favorable time to fire them; *on no account will an attempt be made to drive them back.*

226. As soon as possible after firing is concluded the bores of pieces will be washed clean with water, dried, and oiled, and breechblocks will be dismantled for the purpose of cleaning and oiling the mechanism.

227. *Signals.*—The commands or signals *elevate, depress, right* or *left,* given in pointing, always refer to the direction of motion of the muzzle.

Elevate.—Raise either hand to the height of the head, fingers pointing upward.

Depress.—Raise either hand to the height of the head, fingers pointing downward.

Right or left.—Motion with either hand, fingers pointing in the required direction.

Clamp or halt.—Raise either arm to a horizontal position, fingers closed.

Ready.—Raise either arm vertically to its full extent, fingers extended.

Whistles with rapid-fire guns.—One blast signifies *stand fast,* the pause being of sufficient duration to enable orders to be correctly given and received; to resume operations the command *go on* will be given. Other signals may also be used.

228. *Pointing and firing.*—An abridged range table, or suitable device for determining the time of flight, drift and deflection correction for a 10-mile cross wind for each 200 yards of range, will be kept at each battery of rapid-fire guns and at each gun of greater caliber.

229. The range differences for gun displacement, varying by 10 yards, will be stenciled on the base ring or side of step of the loading platform of 8-inch, 10-inch, and 12-inch guns, so that the proper correction for range difference for any position of the gun will be the number nearest an index marked on the carriage near the elevation scale.

230. *Case I.*—Direction and elevation are given by the sight.

The gun-pointer adjusts the sight in its seat and sets the elevation and deflection scales for the indicated range and deflection, respectively.

He aims at the designated point of the target.

With a fixed target he keeps the line of sight accurately on the designated point and fires as soon after the command *ready* as the piece is aimed, except when otherwise ordered.

With a moving target he keeps the line of sight a little in advance of the target until the command *ready;* he then stops traversing, elevates or depresses the gun if necessary, and fires when the designated point is exactly on the line of sight.

In firing a series of shots with a rapid-fire gun he will observe the splash of his shots if possible and, when necessary, change the deflection to correct for lateral deviation and the elevation to correspond to the changing range of the target.

231. *Case II.*—Direction is given by the sight and elevation by an elevation scale attached to the carriage.

The gun-pointer adjusts the sight in its seat and sets the deflection scale for the indicated deflection.

The elevating detail sets the elevation scale for the indicated range.

With a fixed target the gun-pointer keeps the vertical wire on the target and fires as soon after the command *ready* as the piece is aimed, except when otherwise ordered.

With a moving target he keeps the vertical wire a little in advance of the target until the command *ready;* he then stops traversing and fires when the designated point of the target comes exactly on the vertical wire.

232. *Case III.*—Direction is given by the azimuth circle and elevation by an elevation scale attached to the carriage, or by gunner's quadrant.

With mortars this case is used exclusively.

It is used with guns, (*a*) in firing by battery; (*b*) when the position of a target is known but the target is not visible from the gun on account of smoke, fog, or other intervening obstacle; (*c*) in predicted firing by piece when for any reason direction can not be accurately given by the sight.

The gun-pointer sets or directs the setting of the piece at the approximate azimuth as soon as the truck is removed from the breech. He sets or directs the setting of the correct azimuth as soon as it is received.

The elevating detail sets the elevation scale for the indicated range.

The chief of detachment signals *ready* as soon as the piece is laid.

With a moving target the piece is fired when the target reaches a predicted position; as a rule, at a signal from the battery commander's or primary station.

233. Corrected range and deflection or corrected azimuth are, as a rule, computed in the plotting room and sent to the battery, except for rapid-fire guns.

234. When corrected range and deflection are not computed in this manner, they are determined at the battery, the range by means of a range finder or by trial shots.

The deflection is obtained as follows:

The gun-pointer sets the index of the deflection scale at zero, traverses the gun until the vertical wire is a little in front of some well-defined point of the target and then stops traversing; he calls *ready*, in time to add *take*, when the selected point comes on the line of sight, and keeps it there by turning the deflection screw until the range-keeper calls *halt* at the end of the time of flight.

The gun-pointer calls the reading on the deflection scale to the range-keeper, who combines this reading, with a contrary sign, with the corrections for drift and wind found in the range table (par. 228), the wind component being estimated.

At a rapid-fire battery the deflection will be obtained at one place for all the guns of the battery and the gun commander will generally perform the duties prescribed above for the range-keeper.

235. In case of emergency, to correct for travel of the target alone, the gun-pointer follows the target during the time of flight, notes the reading of the deflection scale, and sets to the corresponding point on the opposite side of zero.

FORMATION OF THE COMPANY AND MARCHING MANEUVERS.

MANNING FORMATION OF A COMPANY FOR SERVICE AT A GUN BATTERY.

236. The company is divided into gun sections, one for each iece assigned to it for service or drill, and a range section.

237. Each gun section consists of a gun commander, a gun detachment, an ammunition detachment, and a reserve.

The detachments for a battery of the secondary armament constitute one gun section under a single gun commander.

238. The gun detachment consists of the noncommissioned officers and privates required for all purposes on the gun platform.

239. The ammunition detachment consists of the noncommissioned officers and as many privates as are required to serve the ammunition from the magazine to the gun platform.

240. Each detachment is subdivided into details, the number, size, and duties of which are given in the drill for each kind of piece.

241. The range section consists of the primary station details, the secondary station detail, such special details as are necessary, and a reserve.

242. The senior noncommissioned officer of each section and detachment is its *chief.*

243. A *chief of detail* is designated for every detail stationed where its work can not be supervised by a *chief of section* or *chief of detachment.*

244. Each chief commands his own subdivision whenever it acts separately and is responsible for its drill efficiency and for the condition of the material to which it is assigned.

245. The chief of a gun section is the gun commander. The chief of an ammunition detachment is the magazine commander.

246. Each chief of section will at all times have a copy of the manning table of his section.

247. The company is formed in two ranks facing to the front; the gun sections are arranged from right to left, the first section on the right; the range section is on the left.

248. Each gun section forms in the following order from right to left: Gun detachment, ammunition detachment, reserve. In the range section the order is: Primary station details, secondary station detail, special details, and reserve.

Posts of Officers, Noncommissioned Officers, Mechanics, and Musicians.

249. The *captain* is twelve paces in front of the center of the line, facing the company.

The *lieutenants* are in line, six paces in front of the center of the right half and left half of the company, in order of rank facing to the front.

The *first sergeant* is two paces to the right of the first section on line with the chiefs of section, facing to the front.

Each *chief of section* is two paces in front of the center of his section, facing to the front.

Each *chief of detachment* is on the right of the front rank of his detachment.

Sergeants not in command, gun-pointers, and range-keepers, are two paces in rear of their detachments in order of rank from right to left.

The *quartermaster sergeant* is posted according to his assignment and rank.

The *mechanics* are two paces in rear of their sections.

The *musicians* are four paces to the right of the chief of the right detachment, aligned on the front rank, and one pace apart.

To Form the Company.

250. At the sounding of the assembly the first sergeant, with a copy of the manning table, takes post about six paces in front of where the center of the company is to be when formed, faces it and commands:

1. ***FALL IN,*** 2. ***CALL ROLLS,*** 3. ***REPORT.*** At the command *fall in* the chiefs of section take posts facing the company and supervise the formation of their sections; the chiefs of detachment place themselves on the line at a sufficient interval apart for the formation of the detachments; the men of each detachment fall in on the left of their chief. The interval between men in a rank is 4 inches; the distance between ranks is 40 inches.

To secure uniformity of interval between files when falling in, each man places the palm of the left hand upon the hip, fingers pointing downward. The hand is dropped by the side when the man next on the left has his interval. The signal having ceased, the first sergeant causes the detachments to close to the right, if necessary. At the command *call rolls* the chiefs of section call rolls and face to the front. At the command *report* the chiefs of section salute and report, in succession from right to left, the result of the roll calls. The first sergeant faces about, reports to the company commander and takes his post without command.

The captain takes his post in front of the company in time to receive the report of the first sergeant, whose salute he returns, and then draws saber.

The lieutenants take their posts and draw sabers when the first ergeant reports.

Known absentees from details are, when practicable, replaced by the first sergeant prior to the formation of the company by making the necessary changes in the posted manning table. Other absentees will be replaced at the battery.

251. The company is formed in column for marching to the right (or left) by facing it to the right (or left), the musician in the rear placing himself abreast of the one in front, the first sergeant placing himself two paces in front (or rear) of the original right file, each gun commander closing into column abreast of the original right (or left) file of his section, the junior lieutenant closing into column abreast of the original left file, and the senior lieutenant closing into column abreast of the first sergeant. The captain takes post where he can best supervise the march of the company.

252. Unless the distance to be marched is short, the distances between files will be increased to 40 inches. The commands are: 1. *Take distance,* 2. ***MARCH.*** The leading file continues the full step, the other files take the half step and resume the full step at 40 inches distance. To resume facing distance the commands are: 1. *Close,* 2. ***MARCH,*** when facing distance is resumed; the leading file takes the half step, the other files successively close to facing distance and take the half step; the rear file having closed up the commands are: 1. *Full step,* 2. ***MARCH,*** when the full step is resumed. If at a halt, the leading file stands fast, the other files close and halt at facing distance. To halt without closing up the commands are: 1. *Company,* 2. ***HALT,*** when all halt.

To Man the Battery.

253. There are three methods:

First. The *company* will, as a rule, be marched to the battery.

Second. The *separate sections* may, when necessary, be sent directly to their posts.

Third. *Call to arms,* when, if practicable, each man goes directly to his post at a run.

In the first case the company commander marches the company to the battery. As the battery is approached he commands: 1. *Sections,* 2. ***POSTS.***

In the second case the company commander commands: 1. *Sections,* 2. ***POSTS.*** Each chief of section marches his section to its post. The battery commander proceeds to his station followed by the musicians. The battery officer and first sergeant go to the battery. The range officer goes to the primary station from the most convenient point. The chief of the range section sends the details to their stations from the most convenient points.

Each detail of the range section prepares for service on reaching its post, making the tests, adjustments, and other prescribed preparations. This having been done the range officer reports to the battery commander: *Sir, stations in order* (or reports any defect he can not immediately correct).

Each gun commander halts his section in rear of its gun emplacement and commands: ***POSTS.*** At this command the gun detachment and ammunition detachment break ranks and the members of the latter proceed to the magazine; the reserve stands fast.

The gun commander assigns the reserve to special work or sends it to a post under cover.

The members of the gun detachment procure the equipments and implements, place them in position, and take posts as prescribed in the drill for the particular kind of gun.

The chief of detachment then commands: ***EXAMINE GUN,*** which is executed as prescribed in the drill for the gun.

The members of the ammunition detachment procure the implements required for their work and take posts as prescribed in the drill for the particular kind of gun.

The chief of the ammunition detachment sees that each member of it knows his duties, makes the inspection and tests necessary to ascertain the condition of the material and reports to the gun commander: *Magazine in order* (or reports defects found).

Having received the reports of the chiefs of the gun and ammunition detachments and seeing that all the details are at their proper stations, the gun commander reports to the battery officer: *Sir, No. — in order* (or reports any defects found).

The battery officer makes a general inspection of the emplacements and reports to the battery commander: *Sir, battery in order* (or reports any defects which he can not immediately rectify).

The first sergeant performs such duties as the battery commander may direct. During action his general duties are to assist the battery officer, replace casualties and supervise the discipline of the enlisted personnel.

To Leave the Battery and Dismiss the Company.

254. At the close of the day's drill or practice, and on notification from the battery commander, the battery officer directs the gun commanders to replace equipments and form sections.

Each gun commander gives the command: 1. ***REPLACE EQUIPMENTS,*** 2. ***FORM SECTION;*** sees that the equipments and implements are all replaced by the same numbers who procured them; that the gun, magazine, and other rooms are properly secured, and that the section forms in proper order in rear of the gun emplacement.

The company will be marched as a whole or the separate sections may be sent directly to the company parade.

In the first case, the sections having been formed, the first sergeant will form the company in line and take his post. A company officer will then march the company to the company parade and dismiss it.

In the second case sections which have marched separately to their gun emplacements will generally return the same way. Each chief of section will march his section to the company parade and dismiss it. Details stationed at a distance from the battery will be conducted to the company parade and dismissed by their chiefs.

MANNING FORMATION OF A COMPANY FOR SERVICE AT A MORTAR BATTERY.

255. For efficient war service the proper assignment of coast artillery to a mortar battery is one company to each emplacement. The following formation is based on such assignment:

256. The company is divided into four gun detachments—an ammunition detachment, a range detachment, and a reserve detachment.

Where there are two magazines for one emplacement there will be a separate ammunition detachment for each.

257. Each gun detachment consists of the noncommissioned officers and privates required to serve a mortar.

258. The ammunition detachment consists of the noncommissioned officers and privates required to serve the ammunition from the magazine to the four mortars of a pit.

259. The range detachment consists of the men assigned to the mortar battery range section.

260. The reserve detachment consists of the men not assigned to particular duties.

261. Each detachment is divided into details, the number, size, and duties of which are given in the drill for the 12-inch mortar.

262. The senior noncommissioned officer of each detachment is its chief.

The chief of the ammunition detachment is the magazine commander.

263. A chief of detail is designated for every detail stationed where its work can not be supervised by a chief of detachment.

264. Each chief commands his own subdivision whenever it acts separately, is responsible for its drill efficiency and for the condition of the material to which it is assigned.

265. Each chief of detachment will at all times have a copy of the manning table of his detachment.

266. The company is formed in two ranks facing to the front; the detachments are arranged from right to left in the following order:

Gun detachments, ammunition detachment, range detachment, reserve detachment; the gun detachments are in the order of their permanent numbers, the first detachment on the right.

Posts of Officers, Noncommissioned Officers, Mechanics, and Musicians.

267. The *captain* is twelve paces in front of the center of the line, facing the company.

The *lieutenants* are in line, six paces in front of the center of the right half and left half of the company, in order of rank, facing to the front.

The *first sergeant* is two paces to the right of the first detachment, on line with the gun commander, facing to the front.

The *gun commander* is two paces in front of the interval between the second and third detachments, facing to the front.

Each *chief of detachment* is on the right of the front rank of his detachment.

Sergeants not in command and gun-pointers are two paces in rear of their detachments.

The *quartermaster sergeant* is posted according to his assignment and rank.

The *mechanics* are two paces in rear of the first and third detachments, respectively.

The *musicians* are four paces to the right of the chief of the first detachment, aligned on the front rank, and one pace apart.

To Form the Company.

268. At the sounding of the assembly, the first sergeant, with a copy of the manning table, takes post about six paces in front of where the center of the company is to be when formed, faces it and commands: 1. *FALL IN,* 2. *CALL ROLLS,* 3. *REPORT.* At the command *fall in* the chiefs of detachment place themselves on the line at a sufficient interval apart for the formation of the detachments; the men of each detachment fall in on the left of their chief. The interval between men in a rank is 4 inches; the distance between ranks is 40 inches.

To secure uniformity of interval between files when falling in, each man places the palm of the left hand upon the hip, fingers pointing downward. The hand is dropped by the side when the man next on the left has his interval. The signal having ceased, the first sergeant causes the detachments to close to the right if necessary. At the command *call rolls* the chiefs of detachment step out two paces in front of the center of their detachments, face toward them, call the rolls, and resume their places in ranks. At the command *report* the chiefs of detachment salute and report, in succession from right to left, the result of the roll calls. The first sergeant faces about, reports to the company commander, and takes his post without command.

The captain takes his post in front of the company in time to receive the report of the first sergeant, whose salute he returns, and then draws saber.

The lieutenants take their posts and draw sabers when the first sergeant reports.

Known absentees from details are, when practicable, replaced by the first sergeant prior to the formation of the company by making the necessary changes in the posted manning table, and in order that the most appropriate changes in the manning table of the entire mortar battery may be made, the first sergeants of the several companies manning the battery will, prior to the formation, confer together.

Other absentees will be replaced at the battery.

269. The company is formed in column for marching to the right (or left) by facing it to the right (or left), the musician in rear placing himself abreast of the one in front, the first sergeant placing himself two paces in front (or rear) of the original right file, the gun commander closing into column abreast of the nearest chief of detachment, the junior lieutenant closing into column abreast of the original left file, and the senior lieutenant closing into column abreast of the first sergeant. The captain takes post where he can best supervise the march of the company.

270. Unless the distance to be marched is short, the distances between files will be increased to 40 inches. Being on the march, the commands are: 1. *Take distance,* 2. ***MARCH.*** The leading file continues the full step; the other files take the half step and resume the full step at 40 inches distance. To resume facing distance, the commands are: 1. *Close,* 2. ***MARCH,*** when facing distance is resumed; the leading file takes the half step, the other files successively close to facing distance and take the half step; the rear file having closed up, the commands are: 1. *Full step,* 2. ***MARCH,*** when the full step is resumed. If at a halt, the leading file stands fast, the other files close and halt at facing distance. To halt without closing up the commands are: 1. *Company,* 2. ***HALT,*** when all halt.

To Man the Battery.

271. There are two methods:

First. The *company* will be marched to the battery.

Second. *Call to arms,* when, if practicable, each man goes directly to his post at a run.

In the first case the company commander marches the company to the battery. On reaching the battery he commands: 1. *Detachments,* 2. ***POSTS.*** Each chief of detachment marches his detachment to its post. The company commander proceeds to his station followed by the musicians. The emplacement officer, first sergeant, and gun commander go to the emplacement to which the company is assigned. The battery range officer (if detailed from the company) goes to the battery primary station from the most convenient point.

The chief of the range detachment sends the details to their stations from the most convenient points. Each chief of detail on reaching his station reports to the chief of the battery range section.

Each chief of gun detachment when in rear of the pit commands: ***POSTS.*** At this command the detachment breaks ranks. The different numbers procure equipments and implements, place them in position and take posts as prescribed in the drill for the mortar.

The gun commander then commands: ***EXAMINE GUN,*** which is executed as prescribed in the drill.

Seeing that all the details are at their proper stations and everything in order the gun commander reports to the emplacement officer: *Sir, pit in order* (or reports any defects found).

The chief of the ammunition detachment halts his detachment in the magazine and commands: ***POSTS.*** At this command the members of the detachment procure the implements required for their work and proceed to their stations.

The chief of the detachment sees that each member of it knows his duties, makes the inspection and tests necessary to ascertain the condition of the material, and reports to the emplacement officer: *Magazine in order* (or reports defects found).

The emplacement officer makes a general inspection of the emplacement and reports to the battery commander: *Sir, emplacement in order* (or reports any defects which he can not immediately rectify).

The reserve is assigned to special work or sent to a post under cover.

The first sergeant performs such duties as the battery commander may direct. During action his general duties are to assist the emplacement officer, replace casualties, and supervise the discipline of the enlisted personnel.

To Leave the Battery and Dismiss the Company.

272. At the close of the day's drill or practice, and on notification from the battery commander, the emplacement officer directs the chiefs of detachment to replace equipments and form detachments.

The company is formed in line in rear of the pit under the supervision of the first sergeant.

The emplacement officer commands: 1. ***REPLACE EQUIPMENTS,*** 2. ***FORM DETACHMENTS.*** Each chief of gun detachment sees that his piece is secured and the chief of the ammunition detachment sees that the magazine is properly secured. Each chief of detachment then forms his detachment in its proper place in the company.

The emplacement officer makes a general inspection and sees that the pieces, magazine, and storerooms are properly secured.

A company officer will then march the company to the company parade and dismiss it.

Details stationed at a distance from the battery will be marched to the company parade and dismissed by their chiefs.

MANNING FORMATION OF A COMPANY FOR SUBMARINE MINE WORK.

273. The company is divided into a range section, a power section, a planting section, a loading section, and a gun section for each battery to which the company is assigned.

274. The range section consists of the primary station details, the secondary station detail, a reserve, and such special details as are necessary.

275. The planting section consists of the men required afloat. It is divided into the planter detachment and the small-boat detachments.

276. The loading section consists of the men required ashore to prepare the mines, cable, etc., for planting. It is divided into the loading-room details, the explosive detail, and the cable detail.

277. The power section consists of the operators and assistants required at the power plants, searchlights, and mining casemate. The men required at each place constitute a detail.

278. A gun section consists of a gun detachment and an ammunition detachment for each gun of the battery, a reserve, and a gun commander. Each detachment is subdivided into details, the number, size, and duties of which are given in the drill for each kind of piece.

279. The senior noncommissioned officer of each section and detachment is its *chief.*

280. A *chief of detail* is designated for every detail stationed where its work can not be supervised by a chief of section or chief of detachment.

281. Each chief commands his own subdivision whenever it acts separately, and is responsible for its drill efficiency and for the condition of the material to which it is assigned.

282. Each chief of section will at all times have a copy of the manning table of his section.

283. The company is formed in two ranks facing to the front. The sections are arranged from right to left in the following order: Range section, power section, gun sections, loading section, planting section.

The detachments and details of the sections are arranged from right to left as follows: In the range section, primary station details, secondary station detail, special details, reserve; in the power section, casemate detail, power details, searchlight details; in a gun section, gun and ammunition detachments, in the order of the pieces to which they are assigned (each ammunition detachment on the left of the corresponding gun detachment), reserve; in the loading section, loading-room details, cable detail, explosive detail; in the planting section, small-boat detachments, planter detachment.

Posts of Officers, Noncommissioned Officers, Mechanics, and Musicians.

284. The *captain* is twelve paces in front of the center of the line, facing the company.

The *lieutenants* are in line, six paces in front of the center of the right half and left half of the company, in order of rank, facing to the front.

The *first sergeant* is two paces to the right of the first section, on line with the chiefs of section, facing to the front.

Each *chief of section* is two paces in front of the center of his section, facing to the front.

Each *chief of detachment* is on the right of the front rank of his detachment.

Sergeants not in command and *gun-pointers* are two paces in rear of their detachments in order of rank from right to left.

The *quartermaster sergeant* is posted according to his assignment and rank.

The *mechanics* are two paces in rear of their sections.

The *musicians* are four paces to the right of the chief of the right detachment, aligned on the front rank, and one pace apart.

To Form the Company.

285. At the sounding of the assembly, the first sergeant, with a copy of the manning table, takes post about six paces in front of where the center of the company is to be when formed, faces it, and commands: 1. *FALL IN*, 2. *CALL ROLLS*, 3. *REPORT*. At the command *fall in* the chiefs of section take posts, facing the company, and supervise the formation of their sections. The interval between men in a rank is 4 inches; the distance between ranks is 40 inches.

To secure uniformity of interval between files when falling in each man places the palm of the left hand upon the hip, fingers pointing downward. The hand is dropped by the side when the man next on the left has his interval. The signal having ceased, the first sergeant causes the sections to close to the right, if necessary. At the command *call rolls* the chiefs of section call rolls and face to the front. At the command *report* the chiefs of section salute and report, in succession from right to left, the result of the roll calls. The first sergeant faces about, reports to the company commander, and takes his post without command.

The captain takes his post in front of the company in time to receive the report of the first sergeant, whose salute he returns, and then draws saber.

The lieutenants take their posts and draw sabers when the first sergeant reports.

Known absentees from details are, when practicable, replaced by the first sergeant prior to the formation of the company by making the necessary changes in the posted manning table.

286. The company is formed in column for marching to the right (or left) by facing it to the right (or left), the musician in the rear placing himself abreast of the one in front, the first sergeant placing himself two paces in front (or rear) of the original right file, each gun commander closing into column abreast of the original right (or left) file of his section, the junior lieutenant closing into column abreast of the original left file, and the senior lieutenant closing into column abreast of the first sergeant. The captain takes post where he can best supervise the march of the company.

287. Unless the distance to be marched is short, the distances between files will be increased to 40 inches. The commands are: 1. *Take distance,* 2. ***MARCH.*** The leading file continues the full step, the other files take the half step and resume the full step at 40 inches distance. To resume facing distance the commands are: 1. *Close,* 2. ***MARCH,*** when facing distance is resumed; the leading file takes the half step, the other files successively close to facing distance and take the half step; the rear file having closed up, the commands are: 1. *Full step,* 2. ***MARCH,*** when the full step is resumed. If at a halt, the leading file stands fast, the other files close and halt at facing distance. To halt without closing up the commands are: 1. *Company,* 2. ***HALT,*** when all halt.

To Man the Mine Command.

288. There are two methods:

First. The company is formed and the separate sections are marched to their posts.

Second. *Call to arms,* when, if practicable, each man goes directly to his post at a run.

In the first case the captain commands: 1. *Sections,* 2. ***POSTS.*** The officers proceed to their stations, the captain followed by the musicians.

The first sergeant performs such duties as the captain may direct.

Each chief of section marches his section to its station, sending the detachments and details to their posts from the most convenient points.

The range and gun sections man their stations and batteries as prescribed in paragraph 253.

The members of the other sections on reaching their posts procure the tools and implements required for their work and prepare for service, as prescribed in the Torpedo Manual and instructions for the operation of power plants and searchlights.

To dismiss the Company.

289. At the close of the day's drill or practice, and on notification from the captain, the lieutenants will direct the chiefs of the subdivisions under their charge to dismiss their subdivisions.

Each chief of section will direct the tools, implements, etc., in use to be replaced, see that the station is properly secured, and command: ***FORM SECTION.*** The section being formed he will march it to the company parade and dismiss it.

Detachments and details stationed at a distance from the rest of the section will be dismissed by their chiefs as prescribed for the chief of section.

Gun sections will be formed as prescribed in paragraph 254.

GENERAL RULE FOR THE FORMATION OF COMPANIES OF COAST ARTILLERY.

290. The manning formation will be used at all roll calls. If infantry exercises are to follow, the company will be formed as infantry after the first sergeant has reported to the captain the result of the roll call.

The captain directs the first sergeant: ***Form as infantry***. The lieutenants do not take the posts prescribed for them in the manning formation.

To form the company as infantry the first sergeant commands: 1. ***As infantry***, 2. ***FORM***.

At the first command the chiefs of section leave the front of the line, each going to the nearest flank; the second sergeant places himself two paces to the front of the line and where the right of the company is to rest. The first sergeant steps back two paces and places himself opposite to where the center of the company is to be.

At the second command the fours form in their proper places on the left of the second sergeant, superintended by the other sergeants, who then take their posts.

The first sergeant faces about and reports to the captain, ***Sir, the company is formed;*** and without command takes his post, passing around the right flank.

If the formation is under arms the rolls are called with pieces at the order, the chiefs of section or chiefs of detachment report with pieces at the order, and the first sergeant, before facing about and reporting to the captain, brings his piece to the right shoulder and commands: 1. ***Port***, 2. ***ARMS***, 3. ***Open***, 4. ***CHAMBER***. 5. ***Close***, 6. ***CHAMBER***, 7. ***Order***, 8. ***ARMS***.

The lieutenants take their posts and draw sabers when the first sergeant reports the company formed.

INSPECTION OF A BATTERY.

291. The battery will be manned, instruments adjusted, and everything prepared for service.

The reserve is posted in two ranks in rear of and facing the emplacement.

The inspector, accompanied by the battery commander, will inspect the battery commander's stations and the guns, carriages, and position-finder stations in such order as may be most convenient.

292. As the inspector approaches a position-finder station the officer or noncommissioned officer in charge will call the detail to attention, salute, and command: ***PREPARE FOR INSPECTION***. The equipment will be inspected and operated as may be necessary to determine its working condition and the efficiency of the personnel.

293. As the inspector approaches the guns he will be met and ted by the battery officer, or emplacement officer, who will accompany the inspector during the inspection of the battery, or emplacement.

When the inspector approaches an emplacement the gun commander commands: 1. ***ATTENTION.*** 2. ***PREPARE FOR INSPECTION.*** The chief the gun detachment then commands: ***OPEN BREECH,*** and gives such other commands as may be necessary for the execution of the inspector's instructions.

Having made the inspection of the gun, carriage, magazine, hoist, etc., the inspector proceeds to the next gun.

294. At the conclusion of the inspection the battery commander will execute such drills as the inspector may order.

INSPECTION OF A FIRE COMMAND.

295. The batteries of the fire command will be manned as for inspection of a battery and the fire commander and his position-finder details will be at their stations.

The inspector, accompanied by the fire commander, will inspect the batteries in succession and the position-finder stations. He also orders such drills as he may desire.

INSPECTION OF A MINE COMMAND.

296. The command will be inspected with the various details at their respective stations and with everything prepared for service. The senior noncommissioned officer present will command: ***ATTENTION,*** as the inspector approaches.

DRILL FOR THE 12-INCH GUN.

(Mounted on disappearing carriage, in an emplacement with a chain hoist on the *left side.* See par. 316.)

GUN DETACHMENT.

297. Chief of detachment, gun-pointer, range-keeper, and 18 privates.

Name of detail.	Posts.
Chief of detachment (sergeant).	Two yards in rear of the breech, facing it.
Gun-pointer (duly qualified noncommissioned officer or private).	Sighting platform.

GUN DETACHMENT—continued.

Name of detail.	Posts.
Range-keeper (noncommissioned officer or private).	Near the elevation scale, on the right or left of the carriage.
Breech detail (3 privates, Nos. 1, 2, and 3).	Nos. 1 and 2 in line immediately in rear of the breech, facing it, No. 1 on the right; No. 3 on the right of the piece, 2 feet from and facing it, opposite the elevating band.
Rammer detail (3 privates, Nos. 4, 13, and 14).	At the platform rail, facing the carriage, No. 4 opposite the rammer, 4 feet from its head, Nos. 13 and 14 four paces to his right and left, respectively.
Elevating detail (2 privates, Nos. 5 and 6).	At the elevating handwheels, facing them, No. 5 on the right of the carriage, No. 6 on the left.
Traversing detail (2 privates, Nos. 7 and 8).	In front of the traversing cranks, facing from the parapet, No. 7 on the right of the carriage, No. 8 on the left.
Tripping detail (2 privates, Nos. 9 and 10).	At the tripping levers, facing the carriage, No. 9 on the right of the carriage, No. 10 on the left.
Truck detail (2 privates, Nos. 11 and 12).	Near the hoist, in rear of a loaded truck, No. 11 on the right, No. 12 on the left, both facing the truck.
Telautograph detail (1 private, No. 15).	At the telautograph.
Hoist detail (3 privates, Nos. 16, 17, and 18).	At the delivery table and facing it.

The posts of the gun detachment as given above are for inspection and preparatory to the service of the gun.

The men resume their posts on completion of any duty requiring them elsewhere.

The chief of detachment and gun-pointer go wherever their presence is necessary.

Duties.

298. *The gun commander* repeats the commands *commence firing* and *cease firing*, announces the kind of projectile to be used, the order of fire, the method of pointing, and, in restricted fire, the number of shots and the firing interval, all in accordance with the orders of the battery commander.

For general duties see pars. 67, 68, 69, 244, 245, 253, 254, and 293.

The chief of detachment is responsible that the general instructions given in pars. 209 to 226, inclusive, are carried out.

For general duties see par. 244.

The gun-pointer.—For general duties see pars. 230 to 235, inclusive.

No. 2 is chief of the breech detail. For general duties see par. 244.

No. 16 is chief of the hoist detail. For general duties see par. 244.

Equipments and Implements.

299. *The gun-pointer* procures the sight and difference chart, places the sight in its seat on the sight standard and the chart in a convenient place for use in Case III.

The range-keeper equips himself with a stop watch.

No. 1 procures the translating roller (or crank for model 1895 mechanism) and a can containing a hand sponge and lubricating oil for the threads of the breechblock and breech recess, places the roller (or crank) in position and the can convenient to the breech.

He procures a silk wiper or cotton waste, which he carries in his belt.

No. 2 procures a silk wiper or cotton waste, which he carries in his belt. If a loading tray is used, he places it convenient to the breech.

No. 3 equips himself with the primer pouch, places the lanyard convenient to the breech, and attaches the holder containing the punch, gimlet, and reamer to the platform railing.

No. 4, assisted by No. 13, procures the rammer and places it on its hooks outside the rail, the head toward the hoist and as nearly in rear of the breech as practicable.

No. 9 procures a wrench for filling plugs, a funnel, and a measure containing oil for filling the recoil cylinders, and places them convenient to his post at the tripping lever.

No. 10 procures the chamber sponge and a wrench for filling plugs, places the sponge on its hooks outside the rail, head toward and near the rammer, and the wrench convenient to his post at the tripping lever.

No. 11 procures the extractor for the dummy charge at drill and places it on the platform against the rail posts in rear of the piece.

No. 12 brings the trucks from their recesses to the delivery table.

No, 13 assists No. 4 with the rammer.

Opening and Closing the Breech.

300. *To open the breech, model 1888 mechanism:* No. 2 releases the rotating crank by turning the winged nut of the catch to the left and then turns the rotating crank clockwise, as indicated by the "open" arrow, till it brings up short in a horizontal position and is secured by its catch. No. 1 turns the translating crank briskly contraclockwise and the block slides back along the rails of the console. When the groove shoulders strike against the ends of these rails the block stops short and the shock frees the console latch from its catch; No. 1 now swings console and block back to the right of the gun till the securing latch engages in the catch. If while the translating roller is turning, the latch of the console fails to work, it must be pushed into place by hand.

To close the breech: No. 2 releases the securing latch from its catch; No. 1 swings the console and block around to the left smartly and then releases the rotating crank by turning the winged nut; No. 2 seizes the handle on the console with the left hand and the translating crank with the right hand, continues the swinging of the block till the console abuts against and is latched to the face of the breech, and then turns the translating crank clockwise till it brings up in a vertical position against the console; No. 1 then turns the rotating crank contraclockwise, as indicated by the "close" arrow, until it brings up short, in a vertical position, and is secured by its catch.

If the loading tray is used, No. 2 removes it, releases the securing latch, places the loading tray on the loading platform, and then seizes the console.

To open the breech, model 1895 mechanism: No. 3 turns the crank continuously in a clockwise direction until the console comes to rest against the hinge plate. He holds the safety lanyard taut and in such a position that the rotating crank can not strike it.

To close the breech: No. 1 turns the crank in a contraclockwise direction until the projecting shoulder on the rotating lug striking the gear prevents further motion.

To Examine Gun.

301. Each member of the detachment reports all defects he finds to the chief of detachment.

The chief of detachment inspects the gun and carriage to see if all parts are in good order and the bearings well lubricated, and examines the gas check and the throttling valve to see if they are properly adjusted. He inspects the firing attachments and tests the electric firing circuit. On completion of the examination he directs the breech to be closed and reports the condition of the piece to the gun commander.

The gun-pointer inspects the sight, tests the sight standard and azimuth subscale for adjustment, and inspects and tests the traversing gear and firing key.

The range-keeper inspects the elevating gear.

No. 1 removes the breech cover and places it out of the way. The breech is opened and No. 1 then examines the breechblock and breech mechanism, cleans them if necessary, and oils all the bearing parts and the threads of the breechblock. He assists in sponging the bore when it is necessary to clean it.

No. 2 examines the bore, chamber, gas-check seat, and breech recess, cleans them if necessary, and oils the threads of the breech recess.

If the bore or chamber needs cleaning, he calls for the sponge and assists in sponging.

No. 3 clears the vent, removing all water, oil, and other obstructions, and wipes the primer seat clean. He frees the lanyard of kinks, hooks it to the ring of the safety lanyard, coils it, beginning at the loop end, and hangs it on the end of the elevating arm.

No. 4 brings the sponges when they are called for, assists No. 2 in sponging the chamber, Nos. 1 and 2 in sponging the bore, and replaces the sponges.

Nos. 5 and *6* test the elevating gear under direction of the range-keeper. (See pars. 305 and 307 to 311.)

Nos. 7 and *8* test the traversing gear under direction of the gun-pointer. (See par. 305.)

Nos. 9 and ***10*** mount on the chassis, each carrying a plug wrench. They remove the filling plugs from both recoil cylinders and ascertain if they contain the proper amount of oil. It is necessary that both cylinders be open when filling is done to avoid the formation of an air cushion. If oil is required, No. 9 calls on No. 11 for the funnel and oil measure, pours oil into the filling hole of one cylinder until the oil reaches the proper level in both cylinders and passes the funnel and measure back to No. 11, who replaces them. Nos. 9 and 10 replace the filling plugs, screw them well home, and then replace the wrenches. They then take posts at the platform rail, facing the carriage, No. 9 two paces to the right and No. 10 two paces to the left of No. 4.

No. 11 receives the muzzle cover and places it out of the way, passes up and replaces the funnel and oil measure when used and then assists No. 12 at the trucks.

No. 12 removes the muzzle cover and passes it to No. 11. He then examines the trucks and cleans and oils them if necessary.

No. 15 examines and tests the telautograph.

If a telephone is provided, he puts on the head receiver and wears it until dismissed.

To Load and Fire.

302. ***The chief of detachment*** commands: 1. ***No.*** —, 2. ***With shot*** (***shell or dummy projectile***), 3. ***LOAD.***

He commands ***in battery*** in time to add ***TRIP*** as soon as the breech is closed. When it is not desired to trip the gun the command ***halt*** is given instead of ***trip.***

The piece being fully in battery and set for elevation, Case II, and for elevation and azimuth, Case III, he commands and signals ***READY*** as soon as the safety switch is closed.

The gun-pointer performs the duties prescribed in paragraph 230, 231, or 232, according to the method of pointing ordered.

He fires the piece electrically, by closing the firing key, and commands: 1. ***No.*** —, 2. ***FIRE,*** at the same time.

He both calls out and signals ***azimuth set,*** Case III, as the piece goes in battery, signaling by holding one hand at the height of the head until the signal ***ready*** is made by the chief of detachment.

The range-keeper calls the range to the elevating detail as often as necessary to keep the piece at the proper elevation and makes range corrections for gun difference when necessary. As the piece comes fully in battery (or as soon thereafter as practicable) he both calls out and signals *elevation set*, signaling by holding one hand at the height of his head until the signal *ready* is made by the chief of detachment. In restricted fire at a specified interval he keeps the time and indicates to the chief of detachment the proper time to trip the gun.

The breech is opened at the command *load*, if not already open (par. 211).

No. 1 examines the breechblock and gas check, wipes off any dirt found, oils the gas check and threads of the breechblock if there is difficulty in opening or closing the breech, assists in ramming, places the third section of the cartridge on the shot tray, and closes the breech as soon as the truck is removed. Immediately after the piece is fired he unhooks the safety lanyard from the eye of the firing leaf.

No. 2 examines the gas-check seat and threads of the breech recess, wipes off any dirt found, and oils the threads if they become dry. The truck being in position at the breech he commands: 1. *Home*, 2. ***RAM***. He assists in ramming, observes the scale on the rammer to make sure that the projectile is properly seated and places the second section of cartridge on the front part of the shot tray.

He pushes the fourth section of cartridge into the chamber by hand until its base barely clears the gas-check seat, a position from which it will be pushed into place by the mushroom head as the breech is closed, remain in contact with it and facilitate ignition.

If the loading tray is used, he seats it before the truck comes to its position at the breech and takes it out and places it on the platform as soon as the truck is removed.

Immediately after the piece is fired and the breech opened he sponges the chamber, assisted by No. 10.

No. 3 inserts a primer in the vent at the command *load*, lowers the slide, takes the lanyard, and, as soon as the breech is closed, hooks the safety lanyard to the eye of the firing leaf.

The slide must be lowered entirely down; otherwise the primer may be blown to the rear and endanger the lives of the men.

At the command *trip* he steps back to a position in rear and slightly to the right of the piece. He pulls the lanyard at the command *fire*, given by the gun-pointer. The lanyard should be pulled with a strong, quick pull—not a jerk.

Immediately after the piece is fired he coils the lanyard as he walks toward the piece. As soon as the breech is opened he removes the fired primer.

No. 4 at the command *load* seizes the rammer near its head, carries it around parallel to the piece, assisted by Nos. 9 and 13, and as the truck comes to its position places the head of the rammer against the base of the projectile. He assists in ramming the projectile and sections of cartridge and in withdrawing the rammer and replacing it on its support.

He also assists No. 1 in closing the breech if the latter finds it difficult to do it alone.

No. 5, assisted by ***No. 6,*** keeps the elevation scale set for the indicated range.

Nos. 5 and 6 remain at their posts when the piece is fired.

Nos. 7 and ***8*** traverse the piece under the gun-pointer's direction and remain at their posts when the piece is fired.

Nos. 9 and ***10*** at the command *load* assist in ramming the projectile, and as soon as the projectile is seated quit the rammer and return to their posts at the tripping levers.

No. 9 also assists in bringing up the rammer.

At the command *in battery* they seize the tripping levers, and at the command *trip* raise them to the full height and then release them.

If the gun fails to run fully in battery, they engage the pinch bars in the notches on the chassis and against the fulcrums on the top carriage and, assisted by Nos. 13 and 14, force the top carriage forward until it is fully in battery. No. 10 closes the safety switch as soon as the piece is in battery. They then go to their posts at the rail.

Immediately after the piece is fired No. 10 brings up the chamber sponge, assists No. 2 in sponging, and replaces the sponge.

Nos. 11 and ***12*** at the command *load* bring up the truck loaded with a cartridge and a projectile of the kind designated. No. 11 is responsible that the proper kind of projectile is brought up. They adjust the height of the shot tray for the height of the breech and place the truck in position for ramming as soon as No. 2 steps aside from the breech. No. 11 steps to the right of the truck and No. 12 to the left. No. 12 sets the brake if there is one; if not, he holds the truck while No. 11 chocks the front wheels. As soon as the rammer is withdrawn after ramming the projectile No. 12 places the first section of cartridge on the front part of the shot tray and pushes it into the screw box. No.

11 places the fourth section on the shot tray. As soon as the fourth section is pushed into the chamber Nos. 11 and 12 remove the truck to the delivery table and take posts at a loaded truck.

Nos. 13 and ***14*** assist in ramming the projectile, in pushing in the sections of cartridge, and in withdrawing the rammer.

They assist Nos. 9 and 10 at the pinch bars when they are used.

No. 13 assists No. 4 in bringing up and replacing the rammer.

No. 15 calls out and posts ranges and deflections or azimuths received.

No. 16 notifies the chief of the ammunition detachment what kind of projectile is required and when to start and stop the hoist to regulate the rate of delivery of ammunition.

Nos. 16, 17, and ***18*** load two trucks with the kind of projectile first ordered and a third truck with the other kind on hand that may be ordered, the first one only with a powder charge.

They load empty trucks returned by the truck detail with the kind of projectile last ordered.

Every time a truck with a powder charge is taken to the piece they place another charge on the proper truck in time for the next round.

Ramming.—The men take positions at the rammer in the following order from front to rear: Nos. 1, 4, 9, 13 on the right side, Nos. 2, 10, 14 on the left side, all facing the rammer and taking hold of it with both hands.

Nos. 13 and ***14*** take hold at the rear end of the rammer, or as near the end as the rail will permit, and the other numbers take hold as far to the rear as practicable without interfering with one another. The rammer head is placed against the base of the projectile as the truck nears the breech At the command ***home***, given the instant the projectile is in proper position, all the numbers take a firm hold, and at the command ***ram***, working together, they send the projectile home in one motion and with all force possible, taking two or three steps toward the breech. Nos. 1 and 2 quit the rammer in time to avoid the truck. Nos. 4, 13, and 14 withdraw the rammer until its head is clear of the shot tray.

As soon as the first three sections of the cartridge are placed on the shot tray, Nos. 4, 13, and 14 push them home without command and then withdraw the rammer.

When there are only three sections of cartridges in the charge the first two are pushed home together with the rammer and the third is pushed into the chamber by hand by No. 2.

To Unload a Dummy Charge.

303. The chief of detachment commands: ***UNLOAD.*** The breech is opened and Nos. 11 and 12 place the truck in position at the breech as for loading and hold it there while the charge is withdrawn.

No. 4 brings up the extractor and pulls the sections of cartridge from the chamber onto the shot tray one at a time.

No. 1 puts two sections on the right cartridge tray of the truck and No. 2 puts the others on the left cartridge tray.

Nos. 1, 2, 3, and 4 withdraw the projectile onto the truck.

No. 4 replaces the extractor, Nos. 11 and 12 remove the truck, and the breech is closed without command.

To Retract the Gun.

304. To bring the gun from the firing to the loading position the chief of detachment commands: 1. *From battery,* 2. ***HEAVE,*** 3. ***HALT.***

At the first command Nos. 7 and 8 go to the retraction cranks. No. 7 operates the retaining pawl and speed crank to permit the pulling out of the ropes. Nos. 9 and 10 mount on the gun levers and place the ends of the ropes on the hooks, receiving them from Nos. 3 and 4, who mount on the chassis to assist. Nos. 1 and 2 pull out the ropes and pass the ends to Nos. 3 and 4. No. 7 takes in the slack. Nos. 7, 8, 9, and 10 take positions at the retraction cranks and at the second command turn the cranks. Nos. 3, 4, 5, and 6 relieve Nos. 7, 8, 9, and 10 when directed by the chief of detachment. Odd numbers work on the right side of the carriage, even numbers on the left side. When the gun has reached the loading position the command *halt* is given. At the command *cast off* No. 7 lets out enough slack to enable Nos. 1 and 2 to take the rope ends off the hook. (See pars. 305 and 311.)

To prevent injury to the ropes by reverse winding in letting out slack, the chief of detachment takes a position where he can see one of the drums and stops the unwinding before the last turn of the rope is off the drum.

To prevent injury to the ropes by winding across the grooves, No. 1 watches the right drum and No. 2 the left until the ropes are taut, and if either rope fails to wind in the proper groove the man on that side calls *halt,* when the winding is stopped and the rope guided into the proper groove, by No. 9 if on the right drum, by No. 10 if on the left. Taking in the slack is then resumed.

For Carriages Provided with Electric Motors.

305. *The gun commander* will each day, before the electric power is used, inspect and test the motor generator and see that the man in charge understands his duties.

Directions for starting, stopping, and caring for the motor generator will be kept posted near it and will be carefully followed.

The chief of detachment will see that all bearings and gears on the carriage connected with the electric motor system are *well oiled immediately before each drill.*

The gun-pointer operates the traversing controllers.

No. 5 operates the elevating and retracting controller.

He sets the maneuver lever and is responsible that it is *never left unpinned.* In changing its setting he will take care that the teeth of the idler are opposite spaces in the gear and that they are brought together with care to avoid marring the teeth.

To retract the gun, at the first command he sets the maneuver lever for retracting and lets out slack to permit the cables to be pulled out. At the second command he pulls the gun down to the loading position, taking care that the gun levers do not strike the recoil buffers. At the third command he stops the motor, lets out enough slack for the removal of the ends of the ropes, sets the index to *off* and *throws the idler out of gear for retraction.*

No. 6 watches the circuit-breakers on the carriage and whenever a circuit is broken by an overload he closes the breaker promptly.

Nos. 7 and *8* remove the traversing and retracting cranks when the motors are to be used. These men then become supernumerary. In case the electric power fails they replace the cranks at once and resume their posts.

306. In the *service of the piece* the gun must never be allowed to go in battery with the retraction ropes attached to the gun levers.

Directions for operating controllers.

307. Do not turn the controller handle on or off suddenly. It may be shifted with considerable rapidity, but all movements should be gentle and easy.

308. Avoid running past the desired setting. It is easier and quicker to stop a little short and perfect the setting by successive movements.

309. Very small movements may be obtained by turning the handle slightly from the off position and then turning it back immediately to the off position.

310. *Never approach the limits of movement at a high rate of speed.* By slowing down the full limits of movement may be attained without risk.

311. In starting retraction turn the controller handle slowly.

Notes on the Drill of the Gun Detachment.

312. Different members of the detachment will be drilled in the duties of the breech detail, and will be required to change posts with the men of that detail when the latter become fatigued.

313. To facilitate the prompt and accurate cooperation of Nos. 5 and 6 in giving elevation, the chief of detachment may, during drill or action, direct both to work at the elevating wheel nearest the elevation scale, No. 5 next to the scale.

314. To insure the prompt cooperation of Nos. 7 and 8 in following targets, the gun-pointer may, during drill or action, direct both to work at the traversing crank on the side of the carriage where they can see his signals.

315. Nos. 1 and 2 move away from the carriage when the gun is tripped, each on his own side.

The other members of the detachment remain at their posts. The gun-pointer and Nos. 3, 5, 6, 7, and 8 should have cotton in their ears.

The men without cotton in their ears should stop them with their fingers when the gun is fired.

316. When the hoist is on the right side of the emplacement the drill is changed as follows:

No. 4 takes position at the rammer on the left side between Nos. 2 and 10; Nos 10 and 14 assist No. 4 in bringing up and replacing the rammer instead of Nos. 9 and 13, respectively; No. 9 brings up and replaces the sponge and assists in sponging instead of No. 10.

317. The members of the detachment must be trained to work together with the utmost celerity and precision and without interfering with one another.

When they become proficient the interval between the commands *load* and *trip* should not as a rule exceed thirty to thirty-five seconds when the primer is inserted while the breech is open, the charge being on a truck and the breech closed when the command *load* is given.

AMMUNITION DETACHMENT.

318. Chief of detachment (sergeant) and 12 privates assigned and numbered as follows:

Hoist detail, Nos. 1 and 2.
Projectile detail, Nos. 3, 4, 5, and 6.
Cartridge detail, Nos. 7, 8, 9, 10, 11, and 12.

Duties.

319. Each member of the detachment on reaching his post examines the material to which he is assigned and reports all defects he finds to the chief of detachment.

The chief of detachment exercises general supervision over the supply of ammunition and is responsible that the designated kind is delivered promptly, that all magazine regulations for safety are enforced, and that the directions for starting, stopping, and operating the hoist and motor are strictly followed. The directions will be kept posted near the motor.

No. 1 operates the controller. He starts the hoist as soon as a projectile is in position to be taken up by a carrier, and then, guided by signals from the delivery table, operates the hoist to keep the delivery table supplied with ammunition.

No. 2 repeats the name of the projectile announced at the delivery table, sees that projectiles and cartridge sections are placed on the receiving table in the proper order and rolls them to the hoist carrier.

If the electric power fails, Nos. 1 and 2 place the hand crank on the shaft and operate the hoist by hand. They are relieved by men from the reserve or by other numbers of the detachment in turn when directed by the chief of detachment.

Nos. 3 and *4* operate a trolley and differential pulley. No. 4 places the shell tongs over the gravity band on a projectile of the kind ordered, locks them and then steadies them while No. 3 hoists until there is sufficient weight on the tongs to prevent their slipping and then assists No. 3 in hoisting. They stop hoisting when the projectile reaches the proper height for the receiving table and run the trolley to the table, No. 3 pulling on the chains and No. 4 pushing on the tongs. No. 3 lowers the projectile onto the table, point toward the gun, and No. 4 removes the tongs.

They then return the trolley for another projectile. In hoisting and lowering projectiles the men should keep the chain on which they pull in the plane of the sheave over which it passes.

Nos. 5 and *6* operate a second trolley and pulley, No. 5 performing the duties prescribed for No. 3, and No. 6 those for No. 4.

Nos. 7 and *8* uncase cartridges and *Nos. 9, 10, 11*, and *12* place the sections on the receiving table, so that full charges alternate with projectiles, as a rule, after the first two projectiles, a shot and a shell, have been sent up.

320. Where the hoist is not adapted to deliver cartridges without injuring them, they will be carried to the loading platform and placed on the trucks by the cartridge detail, and additional men will be assigned to the detail where the distance from the cartridge room to the loading platform renders it necessary.

For an Emplacement With Two Hoists.

321. The gun and ammunition detachments will be increased by enough men for the necessary additional details.

DRILL FOR THE 10-INCH GUN.

(Mounted on disappearing carriage, in an emplacement with a chain hoist on the *left side*. See par. 332.)

GUN DETACHMENT.

322. Chief of detachment, gun-pointer, range-keeper, and 16 privates.

Name of detail.	Posts.
Chief of detachment (sergeant).	Two yards in rear of the breech, facing it.
Gun-pointer (duly qualified noncommissioned officer or private).	Sighting platform.
Range-keeper (noncommissioned officer or private).	Near the elevation scale, on the right or left of the carriage.

GUN DETACHMENT—continued.

Name of detail.	Posts.
Breech detail (3 privates, Nos. 1, 2, and 3).	Nos. 1 and 2 in line immediately in rear of the breech, facing it. No. 1 on the right; No. 3 on the right of the piece, 2 feet from and facing it, opposite the elevating band.
Rammer detail (1 private, No. 4).	At the platform rail, facing the carriage, opposite the rammer, 4 feet from its head.
Elevating detail (2 privates, Nos. 5 and 6).	At the elevating handwheels, facing them, No. 5 on the right of the carriage, No. 6 on the left.
Traversing detail (2 privates, Nos 7 and 8).	In front of the traversing cranks, facing from the parapet, No. 7 on the right of the carriage, No. 8 on the left.
Tripping detail (2 privates, Nos. 9 and 10).	At the tripping levers, facing the carriage, No. 9 on the right of the carriage, No. 10 on the left.
Truck detail (2 privates, Nos. 11 and 12).	Near the hoist, in rear of a loaded truck, No. 11 on the right, No. 12 on the left, both facing the truck.
Telautograph detail (1 private, No. 15).	At the telautograph.
Hoist detail (3 privates, Nos. 16, 17, and 18).	At the delivery table and facing it.

The posts of the gun detachment as given above are for inspection and preparatory to the service of the gun.

The men resume their posts on completion of any duty requiring them elsewhere.

The chief of detachment and gun-pointer go wherever their presence is necessary.

Duties.

323. *The gun commander* repeats the commands *commence firing* and *cease firing,* announces the kind of projectile to be used, the order of fire, the method of pointing and, in restricted fire, the number of shots and the firing interval, all in accordance with the orders of the battery commander.

For general duties see pars. 67, 68, 69, 244, 245, 253, 254, and 293.

The chief of detachment is responsible that the general instructions given in pars. 209 to 226, inclusive, are carried out.

For general duties see par. 244.

The gun-pointer.—For general duties see pars. 230 to 235, inclusive.

No. 2 is chief of the breech detail. For general duties see par. 244.

No. 16 is chief of the hoist detail. For general duties see par. 244.

Equipments and Implements.

324. *The gun-pointer* procures the sight and difference chart, places the sight on its seat on the sight standard and the chart in a convenient place for use in Case III.

The range-keeper equips himself with a stop watch.

No. 1 procures the translating roller (or crank for model 1895 mechanism) and a can containing a hand sponge and lubricating oil for the threads of the breechblock and breech recess, places the roller or (crank) in position and the can convenient to the breech.

He procures a silk wiper or cotton waste, which he carries in his belt.

No. 2 procures a silk wiper or cotton waste, which he carries in his belt. If a loading tray is used, he places it convenient to the breech.

No. 3 equips himself with the primer pouch, places the lanyard convenient to the breech, and attaches the holder containing the punch, gimlet, and reamer to the platform railing.

No. 4 procures the rammer and places it on its hooks outside the rail, the head toward the hoist and as nearly in rear of the breech as practicable.

No. 9 procures a wrench for filling plugs, a funnel, and a measure containing oil for filling the recoil cylinders, and places them convenient to his post at the tripping lever.

No. 10 procures the chamber sponge and a wrench for filling plugs, places the sponge on its hooks outside the rail, head toward and near the rammer, and the wrench convenient to his post at the tripping lever.

No. 11 procures the extractor for the dummy charge at drill and places it on the platform against the rail posts in rear of the piece.

No. 12 brings the trucks from the recesses to the delivery table.

Opening and Closing the Breech.

325. Executed as prescribed in par. 300.

To Examine Gun.

326. Each member of the detachment reports all defects he finds to the chief of detachment.

The chief of detachment inspects the gun and carriage to see if all parts are in good order and the bearings well lubricated, and examines the gas check and the throttling valve to see if they are properly adjusted. He inspects the firing attachments and tests the electric firing circuit. On completion of the examination he directs the breech to be closed and reports the condition of the piece to the gun commander.

The gun-pointer inspects the sight, tests the sight standard and azimuth subscale for adjustment, and inspects and tests the traversing gear and firing key.

The range-keeper inspects the elevating gear.

No. 1 removes the breech cover and places it out of the way. The breech is opened and No. 1 then examines the breechblock and breech mechanism, cleans them if necessary, and oils all the bearing parts and the threads of the breechblock. He assists in sponging the bore when it is necessary to clean it.

No. 2 examines the bore, chamber, gas-check seat, and breech recess, cleans them if necessary, and oils the threads of the breech recess.

If the bore or chamber needs cleaning, he calls for the sponge and assists in sponging.

No. 3 clears the vent, removing all water, oil, and other obstructions, and wipes the primer seat clean. He frees the lanyard of kinks, hooks it to the ring of the safety lanyard. coils it, beginning at the loop end, and hangs it on the end of the elevating arm.

***No.* 4** brings the sponges when they are called for, assists No. 2 in sponging the chamber, Nos. 1 and 2 in sponging the bore, and replaces the sponges.

Nos.* 5** and ***6 test the elevating gear under direction of the range-keeper. (See pars. 305 and 307 to 311.)

Nos.* 7** and ***8 test the traversing gear under direction of the gun-pointer. (See par. 305.)

Nos.* 9** and ***10 mount on the chassis, each carrying a plug wrench. They remove the filling plugs from both recoil cylinders and ascertain if they contain the proper amount of oil. It is necessary that both cylinders be open when filling is done to avoid the formation of an air cushion. If oil is required, No. 9 calls on No. 11 for the funnel and oil measure, pours oil into the filling hole of one cylinder until the oil reaches the proper level in both cylinders, and passes the funnel and measure back to No. 11, who replaces them. Nos. 9 and 10 replace the filling plugs, screw them well home, and then replace the wrenches. They then take posts at the platform rail facing the carriage, No. 9 four paces to the right and No. 10 four paces to the left of No. 4.

***No.* 11** receives the muzzle cover and places it out of the way, passes up and replaces the funnel and oil measure when used, and then assists No. 12 at the trucks.

***No.* 12** removes the muzzle cover and passes it to No. 11. He then examines the trucks and cleans and oils them if necessary.

***No.* 15** examines and tests the telautograph.

If a telephone is provided, he puts on the head receiver and wears it until dismissed.

To Load and Fire.

327. ***The chief of detachment*** commands: 1. ***No.* —**, 2. ***With shot*** (***shell or dummy projectile***), 3. ***LOAD.***

He commands ***in battery*** in time to add ***TRIP,*** as soon as the breech is closed. When it is not desired to trip the gun the command ***halt*** is given instead of ***trip.***

The piece being fully in battery and set for elevation, Case II, and for elevation and azimuth, Case III, he commands and signals ***READY*** as soon as the safety switch is closed.

The gun-pointer performs the duties prescribed in par. 230, 231, or 232, according to the method of pointing ordered.

He fires the piece electrically by closing the firing key, and commands: 1. ***No.* —**, 2. ***FIRE,*** at the same time.

He both calls out and signals *azimuth set*, Case III, as the piece goes in battery, signaling by holding one hand at the height of the head until the signal *ready* is made by the chief of detachment.

The range-keeper calls the range to the elevating detail as often as necessary to keep the piece at the proper elevation and makes range corrections for gun difference when necessary. As the piece comes fully in battery (or as soon thereafter as practicable) he both calls out and signals *elevation set*, signaling by holding one hand at the height of his head until the signal *ready* is made by the chief of detachment. In restricted fire at a specified interval he keeps the time and indicates to the chief of detachment the proper time to trip the gun.

The breech is opened at the command *load*, if not already open (par. 211).

No. 1 examines the breechblock and gas check, wipes off any dirt found, oils the gas check and threads of the breechblock if there is difficulty in opening or closing the breech, assists in ramming the projectile and first section of cartridge, and closes the breech as soon as the truck is removed.

Immediately after the piece is fired he unhooks the safety lanyard from the eye of the firing leaf.

No. 2 examines the gas-check seat and threads of the breech recess, wipes off any dirt found, and oils the threads if they become dry. The truck being in position at the breech, he commands: 1. *Home*, 2. ***RAM***. He assists in ramming the projectile and observes the scale on the rammer to make sure that the projectile is properly seated.

He pushes the second section of cartridge into the chamber by hand until its base barely clears the gas-check seat, a position from which it will be pushed into place by the mushroom head as the breech is closed, remain in contact with it and facilitate ignition.

If the loading tray is used, he seats it before the truck comes to its position at the breech and takes it out and places it on the platform as soon as the truck is removed.

Immediately after the piece is fired and the breech opened he sponges the chamber, assisted by No. 10.

No. 3 inserts a primer in the vent at the command *load*, lowers the slide, takes the lanyard and, as soon as the breech is closed, hooks the safety lanyard to the eye of the firing leaf. *The slide*

Duties.

323. *The gun commander* repeats the commands *commence firing* and *cease firing,* announces the kind of projectile to be used, the order of fire, the method of pointing and, in restricted fire, the number of shots and the firing interval, all in accordance with the orders of the battery commander.

For general duties see pars. 67, 68, 69, 244, 245, 253, 254, and 293.

The chief of detachment is responsible that the general instructions given in pars. 209 to 226, inclusive, are carried out.

For general duties see par. 244.

The gun-pointer.—For general duties see pars. 230 to 235, inclusive.

No. 2 is chief of the breech detail. For general duties see par. 244.

No. 16 is chief of the hoist detail. For general duties see par. 244.

Equipments and Implements.

324. *The gun-pointer* procures the sight and difference chart, places the sight on its seat on the sight standard and the chart in a convenient place for use in Case III.

The range-keeper equips himself with a stop watch.

No. 1 procures the translating roller (or crank for model 1895 mechanism) and a can containing a hand sponge and lubricating oil for the threads of the breechblock and breech recess, places the roller or (crank) in position and the can convenient to the breech.

He procures a silk wiper or cotton waste, which he carries in his belt.

No. 2 procures a silk wiper or cotton waste, which he carries in his belt. If a loading tray is used, he places it convenient to the breech.

No. 3 equips himself with the primer pouch, places the lanyard convenient to the breech, and attaches the holder containing the punch, gimlet, and reamer to the platform railing.

No. 4 procures the rammer and places it on its hooks outside the rail, the head toward the hoist and as nearly in rear of the breech as practicable.

No. 9 procures a wrench for filling plugs, a funnel, and a measure containing oil for filling the recoil cylinders, and places them convenient to his post at the tripping lever.

No. 10 procures the chamber sponge and a wrench for filling plugs, places the sponge on its hooks outside the rail, head toward and near the rammer, and the wrench convenient to his post at the tripping lever.

No. 11 procures the extractor for the dummy charge at drill and places it on the platform against the rail posts in rear of the piece.

No. 12 brings the trucks from the recesses to the delivery table.

Opening and Closing the Breech.

325. Executed as prescribed in par. 300.

To Examine Gun.

326. Each member of the detachment reports all defects he finds to the chief of detachment.

The chief of detachment inspects the gun and carriage to see if all parts are in good order and the bearings well lubricated, and examines the gas check and the throttling valve to see if they are properly adjusted. He inspects the firing attachments and tests the electric firing circuit. On completion of the examination he directs the breech to be closed and reports the condition of the piece to the gun commander.

The gun-pointer inspects the sight, tests the sight standard and azimuth subscale for adjustment, and inspects and tests the traversing gear and firing key.

The range-keeper inspects the elevating gear.

No. 1 removes the breech cover and places it out of the way. The breech is opened and No. 1 then examines the breechblock and breech mechanism, cleans them if necessary, and oils all the bearing parts and the threads of the breechblock. He assists in sponging the bore when it is necessary to clean it.

No. 2 examines the bore, chamber, gas-check seat, and breech recess, cleans them if necessary, and oils the threads of the breech recess.

If the bore or chamber needs cleaning, he calls for the sponge and assists in sponging.

No. 3 clears the vent, removing all water, oil, and other obstructions, and wipes the primer seat clean. He frees the lanyard of kinks, hooks it to the ring of the safety lanyard. coils it, beginning at the loop end, and hangs it on the end of the elevating arm.

No. 4 brings the sponges when they are called for, assists No. 2 in sponging the chamber, Nos. 1 and 2 in sponging the bore, and replaces the sponges.

Nos. 5 and *6* test the elevating gear under direction of the range-keeper. (See pars. 305 and 307 to 311.)

Nos. 7 and *8* test the traversing gear under direction of the gun-pointer. (See par. 305.)

Nos. 9 and *10* mount on the chassis, each carrying a plug wrench. They remove the filling plugs from both recoil cylinders and ascertain if they contain the proper amount of oil. It is necessary that both cylinders be open when filling is done to avoid the formation of an air cushion. If oil is required, No. 9 calls on No. 11 for the funnel and oil measure, pours oil into the filling hole of one cylinder until the oil reaches the proper level in both cylinders, and passes the funnel and measure back to No. 11, who replaces them. Nos. 9 and 10 replace the filling plugs, screw them well home, and then replace the wrenches. They then take posts at the platform rail facing the carriage, No. 9 four paces to the right and No. 10 four paces to the left of No. 4.

No. 11 receives the muzzle cover and places it out of the way, passes up and replaces the funnel and oil measure when used, and then assists No. 12 at the trucks.

No. 12 removes the muzzle cover and passes it to No. 11. He then examines the trucks and cleans and oils them if necessary.

No. 15 examines and tests the telautograph.

If a telephone is provided, he puts on the head receiver and wears it until dismissed.

To Load and Fire.

327. *The chief of detachment* commands: 1. *No.* —, 2. *With shot* (*shell or dummy projectile*), 3. *LOAD.*

He commands *in battery* in time to add *TRIP,* as soon as the breech is closed. When it is not desired to trip the gun the command *halt* is given instead of *trip.*

The piece being fully in battery and set for elevation, Case II, and for elevation and azimuth, Case III, he commands and signals *READY* as soon as the safety switch is closed.

The gun-pointer performs the duties prescribed in par. 230, 231, or 232, according to the method of pointing ordered.

He fires the piece electrically by closing the firing key, and commands: 1. *No.* —, 2. *FIRE,* at the same time.

He both calls out and signals *azimuth set,* Case III, as the piece goes in battery, signaling by holding one hand at the height of the head until the signal *ready* is made by the chief of detachment.

The range-keeper calls the range to the elevating detail as often as necessary to keep the piece at the proper elevation and makes range corrections for gun difference when necessary. As the piece comes fully in battery (or as soon thereafter as practicable) he both calls out and signals *elevation set,* signaling by holding one hand at the height of his head until the signal *ready* is made by the chief of detachment. In restricted fire at a specified interval he keeps the time and indicates to the chief of detachment the proper time to trip the gun.

The breech is opened at the command *load,* if not already open (par. 211).

No. 1 examines the breechblock and gas check, wipes off any dirt found, oils the gas check and threads of the breechblock if there is difficulty in opening or closing the breech, assists in ramming the projectile and first section of cartridge, and closes the breech as soon as the truck is removed.

Immediately after the piece is fired he unhooks the safety lanyard from the eye of the firing leaf.

No. 2 examines the gas-check seat and threads of the breech recess, wipes off any dirt found, and oils the threads if they become dry. The truck being in position at the breech, he commands: 1. *Home,* 2. ***RAM.*** He assists in ramming the projectile and observes the scale on the rammer to make sure that the projectile is properly seated.

He pushes the second section of cartridge into the chamber by hand until its base barely clears the gas-check seat, a position from which it will be pushed into place by the mushroom head as the breech is closed, remain in contact with it and facilitate ignition.

If the loading tray is used, he seats it before the truck comes to its position at the breech and takes it out and places it on the platform as soon as the truck is removed.

Immediately after the piece is fired and the breech opened he sponges the chamber, assisted by No. 10.

No. 3 inserts a primer in the vent at the command *load*, lowers the slide, takes the lanyard and, as soon as the breech is closed, hooks the safety lanyard to the eye of the firing leaf. ***The slide***

must be lowered entirely down; otherwise the primer may be blown to the rear and endanger the lives of the men.

At the command *trip* he steps back to a position in rear and slightly to the right of the piece. He pulls the lanyard at the command *fire* given by the gun-pointer. The lanyard should be pulled with a strong, quick pull—not a jerk.

Immediately after the piece is fired he coils the lanyard as he walks toward the piece. As soon as the breech is opened he removes the fired primer.

No. 4 at the command *load* seizes the rammer near its head, carries it around parallel to the piece, assisted by No. 9, and as the truck comes to its position places the head of the rammer against the base of the projectile. He assists in ramming the projectile and first section of cartridge and withdraws the rammer and replaces it on its support.

No. 5, assisted by *No. 6,* keeps the elevation scale set for the indicated range.

Nos. 5 and 6 remain at their posts when the piece is fired.

Nos. 7 and *8* traverse the piece under the gun-pointer's direction and remain at their posts when the piece is fired.

Nos. 9 and *10* at the command *load* assist in ramming the projectile, and as soon as the projectile is seated quit the rammer and return to their posts at the tripping levers.

At the command *in battery* they seize the tripping levers and at the command *trip* raise them to the full height and then release them.

If the gun fails to run fully in battery, they engage the pinch bars in the notches on the chassis and against the fulcrums on the top carriage and, assisted by Nos. 1 and 2, force the top carriage forward until it is fully in battery. No. 10 closes the safety switch as soon as the piece is in battery. They then go to their posts at the rail.

Immediately after the piece is fired No. 10 brings up the chamber sponge, assists No. 2 in sponging, and replaces the sponge.

Nos. 11 and *12* at the command *load* bring up the truck loaded with a cartridge and a projectile of the kind designated. No. 11 is responsible that the proper kind of projectile is brought up. They adjust the height of the shot tray for the height of the breech and place the truck in position for ramming as soon as No. 2 steps aside from the breech. No. 11 steps to the right of the truck and No. 12 to the left. No. 12 sets the brake if there is one; if not, he holds the truck while No. 11 chocks the front wheels. As soon as the rammer is withdrawn after ramming the projectile, No. 12 places the first section of cartridge on the shot tray. No. 11 places the second section on the shot tray on the withdrawal of the rammer after the first section is pushed in. As soon as the second section is pushed into the chamber, Nos. 11 and 12 remove the truck to the delivery table and take posts at a loaded truck.

No. 15 calls out and posts ranges and deflections or azimuths received..

No. 16 notifies the chief of the ammunition detachment what kind of projectile is required and when to start and stop the hoist to regulate the rate of delivery of ammunition.

Nos. 16, 17, and *18* load two trucks with the kind of projectile first ordered and a third truck with the other kind on hand that may be ordered, the first one only with a powder charge.

They load empty trucks returned by the truck detail with the kind of projectile last ordered.

Every time a truck with a powder charge is taken to the piece, they place another charge on the proper truck in time for the next round.

Ramming—The men take positions at the rammer in the following order from front to rear: Nos. 1, 4, and 9 on the right side, Nos. 2 and 10 on the left side, all facing the rammer and taking hold of it with both hands.

Nos. 9 and *10* take hold at the rear end of the rammer or as near the end as the rail will permit and the other numbers take hold as far to the rear as practicable without interfering with one another. The rammer head is placed against the base of the projectile as the truck nears the breech. At the command *home,* given the instant the projectile is in proper position, all the numbers take a firm hold, and at the command *ram,* working together, they send the projectile home in one motion and with all force possible, taking two or three steps toward the breech. Nos. 1 and 4 withdraw the rammer until its head is clear of the shot tray.

As soon as the first section of the cartridge is placed on the shot tray Nos. 1 and 4 push it home without unnecessary force, without command, and then withdraw the rammer.

To Unload a Dummy Charge.

328. The chief of detachment commands: *UNLOAD.* The breech is opened and Nos. 11 and 12 place the truck in position at the breech as for loading and hold it there while the charge is withdrawn.

No. 4 brings up the extractor and pulls the sections of cartridge from the chamber onto the shot tray one at a time.

No. 1 puts one section on the right cartridge tray of the truck and No. 2 puts the other section on the left cartridge tray.

Nos. 1, 2, 3, and 4 withdraw the projectile onto the truck.

No. 4 replaces the extractor, Nos. 11 and 12 remove the truck, and the breech is closed without command.

To Retract the Gun.

329. To bring the gun from the firing to the loading position the chief of detachment commands: 1. *From battery*. 2. ***HEAVE***. 3. ***HALT***.

At the first command Nos. 7 and 8 go to the retraction cranks. No. 7 operates the retaining pawl and speed crank to permit the pulling out of the ropes. Nos. 9 and 10 mount on the gun levers and place the ends of the ropes on the hooks, receiving them from Nos. 3 and 4, who mount on the chassis to assist. Nos. 1 and 2 pull out the ropes and pass the ends to Nos. 3 and 4. No. 7 takes in the slack. Nos. 7, 8, 9, and 10 take positions at the retraction crank and at the second command turn the cranks. Nos. 3, 4, 5, and 6 relieve Nos. 7, 8, 9, and 10 when directed by the chief of detachment. Odd numbers work on the right side of the carriage, even numbers on the left side. When the gun has reached the loading position the command *halt* is given. At the command *cast off* No. 7 lets out enough slack to enable Nos. 1 and 2 to take the rope ends off the hooks. (See pars. 305 and 311.)

To prevent injury to the ropes by reverse winding in letting out slack, the chief of detachment takes a position where he can see one of the drums and stops the unwinding before the last turn of the rope is off the drum.

To prevent injury to the ropes by winding across the grooves, No. 1 watches the right drum and No. 2 the left until the ropes are taut, and if either rope fails to wind in the proper groove the man at that side calls *halt*, when the winding is stopped and the rope guided into the proper groove by No. 9 if on the right drum, by No. 10 if on the left. Taking in the slack is then resumed.

For Carriages Provided with Electric Motors.

330. Executed as prescribed in pars. 305 to 311.

335. Where the hoist is not adapted to deliver cartridges without injuring them, they will be carried to the loading platform and placed on the trucks by the cartridge detail, and additional men will be assigned to the detail where the distance from the cartridge room to the loading platform renders it necessary.

DRILL FOR THE 8-INCH GUN.

(Mounted on disappearing carriage, in an emplacement with a chain hoist on the *left side*. See par. 345.)

GUN DETACHMENT.

336. Chief of detachment, gun-pointer, range-keeper, and 14 privates.

Name of detail.	Posts.
Chief of detachment (sergeant).	Two yards in rear of the breech, facing it.
Gun-pointer (duly qualified noncommissioned officer or private).	Sighting platform.
Range-keeper (noncommissioned officer or private).	Near the elevation scale on the right or left of the carriage.
Breech detail (3 privates, Nos. 1, 2, and 3).	Nos. 1 and 2 in line immediately in rear of the breech, facing it, No. 1 on the right; No. 3 on the right of the piece, 2 feet from and facing it, opposite the elevating band.
Rammer detail (1 private, No. 4).	At the platform rail, facing the carriage, opposite the rammer, 4 feet from its head.
Elevating detail (2 privates, Nos. 5 and 6).	At the elevating handwheels, facing them, No. 5 on the right of the carriage, No. 6 on the left.
Traversing detail (2 privates, Nos. 7 and 8).	In front of the traversing cranks, facing from the parapet, No. 7 on the right of the carriage, No. 8 on the left.

Duties.

334. Each member of the detachment on reaching his post examines the material to which he is assigned and reports all defects he finds to the chief of detachment.

The chief of detachment exercises general supervision over the supply of ammunition and is responsible that the designated kind is delivered promptly and that all magazine regulations for safety are enforced, and that the directions for starting, stopping, and operating the hoist and motor are strictly followed.

The directions will be kept posted near the motor.

No. 1 operates the controller. He starts the hoist as soon as a projectile is in position to be taken up by a carrier and then, guided by signals from the delivery table, operates the hoist to keep the delivery table supplied with ammunition.

No. 2 repeats the name of the projectile announced at the delivery table, sees that projectiles and cartridge sections are placed on the receiving table in the proper order, and rolls them to the hoist carrier.

If the electric power fails, Nos. 1 and 2 place the hand cranks on the shaft and operate the hoist by hand. They are relieved by men from the reserve or by other numbers of the detachment in turn when directed by the chief of detachment.

Nos. 3 and *4* operate a trolley and differential pulley. No. 4 places the shell tongs over the gravity band on a projectile of the kind ordered, locks them, and then steadies them while No. 3 hoists until there is sufficient weight on the tongs to prevent their slipping and then assists No. 3 in hoisting. They stop hoisting when the projectile reaches the proper height for the receiving table and run the trolley to the table, No. 3 pulling on the chains and No. 4 pushing on the tongs. No. 3 lowers the projectile onto the table, point toward the gun, and No. 4 removes the tongs. They then return the trolley for another projectile. In hoisting and lowering projectiles the men should keep the chain on which they pull in the plane of the sheave over which it passes.

Nos. 5 and *6* operate a second trolley and pulley, No. 5 performing the duties prescribed for No. 3 and No. 6 those for No. 4.

Nos. 7 and *8* uncase cartridges and Nos. 9 and 10 place the sections on the receiving table, so that full charges alternate with projectiles, as a rule, after the first two projectiles, a shot and a shell, have been sent up.

335. Where the hoist is not adapted to deliver cartridges without injuring them, they will be carried to the loading platform and placed on the trucks by the cartridge detail, and additional men will be assigned to the detail where the distance from the cartridge room to the loading platform renders it necessary.

DRILL FOR THE 8-INCH GUN.

(Mounted on disappearing carriage, in an emplacement with a chain hoist on the *left side*. See par. 345.)

GUN DETACHMENT.

336. Chief of detachment, gun-pointer, range-keeper, and 14 privates.

Name of detail.	Posts.
Chief of detachment (sergeant).	Two yards in rear of the breech, facing it.
Gun-pointer (duly qualified noncommissioned officer or private).	Sighting platform.
Range-keeper (noncommissioned officer or private).	Near the elevation scale on the right or left of the carriage.
Breech detail (3 privates, Nos. 1, 2, and 3).	Nos. 1 and 2 in line immediately in rear of the breech, facing it, No. 1 on the right; No. 3 on the right of the piece, 2 feet from and facing it, opposite the elevating band.
Rammer detail (1 private, No. 4).	At the platform rail, facing the carriage, opposite the rammer, 4 feet from its head.
Elevating detail (2 privates, Nos. 5 and 6).	At the elevating handwheels, facing them, No. 5 on the right of the carriage, No. 6 on the left.
Traversing detail (2 privates, Nos. 7 and 8).	In front of the traversing cranks, facing from the parapet, No. 7 on the right of the carriage, No. 8 on the left.

GUN DETACHMENT—continued.

Name of detail.	Posts.
Tripping detail (2 privates, Nos. 9 and 10).	At the tripping levers, facing the carriage, No. 9 on the right of the carriage, No. 10 on the left.
Truck detail (1 private, No. 11).	Near the hoist, in rear of a loaded truck.
Telautograph detail (1 private, No. 15).	At the telautograph.
Hoist detail (2 privates, Nos. 16 and 17).	At the delivery table and facing it.

The posts of the gun detachment as given above are for inspection and preparatory to the service of the gun.

The men resume their posts on completion of any duty requiring them elsewhere.

The chief of detachment and gun-pointer go wherever their presence is necessary.

Duties.

337. ***The gun commander*** repeats the commands ***commence firing*** and ***cease firing,*** announces the kind of projectile to be used, the order of fire, the method of pointing, and, in restricted fire, the number of shots and the firing interval, all in accordance with the orders of the battery commander.

For general duties see pars. 67, 68, 69, 244, 245, 253, 254, and 293.

The chief of detachment is responsible that the general instructions given in pars. 209 to 226, inclusive, are carried out.

For general duties see par. 244.

The gun-pointer.—For general duties see pars. 230 to 235, inclusive.

No. 2 is chief of the breech detail. For general duties see par. 244.

No. 16 is chief of the hoist detail. For general duties see par. 244.

Equipments and Implements

338. *The gun-pointer* procures the sight and difference chart, places the sight on its seat on the sight standard and the chart in a convenient place for use in Case III.

The range-keeper equips himself with a stop watch.

No. 1 procures the translating roller and a can containing a hand sponge and lubricating oil for the threads of the breechblock and breech recess, places the roller in position and the can convenient to the breech.

He procures a silk wiper or cotton waste, which he carries in his belt.

No. 2 procures a silk wiper or cotton waste, which he carries in his belt. If a loading tray is used, he places it convenient to the breech.

No. 3 equips himself with the primer pouch, places the lanyard convenient to the breech, and attaches the holder, containing the punch, gimlet, and reamer, to the platform railing.

No. 4 procures the rammer and places it on its hooks outside the rail, the head toward the hoist and as nearly in rear of the breech as practicable.

No. 9 procures a wrench for filling plugs, a funnel, and a measure containing oil for filling the recoil cylinders, and places them convenient to his post at the tripping lever.

No. 10 procures the chamber sponge and a wrench for filling plugs, places the sponge on its hooks outside the rail, head toward and near the rammer and the wrench convenient to his post at the tripping lever.

No. 11 procures the extractor for the dummy charge at drill, places it on the platform against the rail posts in rear of the piece, and brings the trucks from the recesses to the delivery table.

Opening and Closing the Breech.

339. Executed as prescribed in par. 300.

To Examine Gun.

340. Each member of the detachment reports all defects he finds to the chief of detachment.

The chief of detachment inspects the gun and carriage to see if all parts are in good order and the bearings well lubricated and examines the gas check and the throttling valve to see if they are properly adjusted. He inspects the firing attachments and tests the electric firing circuit. On completion of the examination he directs the breech to be closed and reports the condition of the piece to the gun commander.

The gun-pointer inspects the sight, tests the sight standard and azimuth subscale for adjustment, and inspects and tests the traversing gear and firing key.

The range-keeper inspects the elevating gear.

No. 1 removes the breech cover and places it out of the way. The breech is opened, and No. 1 then examines the breechblock and breech mechanism, cleans them if necessary, and oils all the bearing parts and the threads of the breechblock. He assists in sponging the bore when it is necessary to clean it.

No. 2 examines the bore, chamber, gas-check seat, and breech recess, cleans them if necessary, and oils the threads of the breech recess.

If the bore or chamber needs cleaning, he calls for the sponge and assists in sponging.

No. 3 clears the vent, removing all water, oil, and other obstructions, and wipes the primer seat clean. He frees the lanyard of kinks, hooks it to the ring of the safety lanyard, coils it, beginning at the loop end, and hangs it on the end of the elevating arm.

No. 4 brings the sponges when they are called for, assists No. 2 in sponging the chamber, Nos. 1 and 2 in sponging the bore, and replaces the sponges.

Nos. 5 and *6* test the elevating gear under direction of the range-keeper. (See pars. 305 and 307 to 311).

Nos. 7 and *8* test the traversing gear under direction of the gun-pointer. (See par. 305).

Nos. 9 and *10* mount on the chassis, each carrying a plug wrench. They remove the filling plugs from both recoil cylinders and ascertain if they contain the proper amount of oil. It is necessary that both cylinders be open when filling is done to avoid the formation of an air cushion. If oil is required, No. 9 calls on No. 11 for the funnel and oil measure, pours oil into the filling hole of one cylinder until the oil reaches the proper level in both cylinders, and passes the funnel and measure back to No. 11, who replaces them. Nos. 9 and 10 replace the filling plugs, screw them well home, and replace the wrenches. They then take posts at the platform rail facing the carriage, No. 9 four paces to the right and No. 10 four paces to the left of No. 4.

No. 11 removes the muzzle cover and places it out of the way, passes up and replaces the funnel and oil measure when used, and then examines the trucks and cleans and oils them if necessary.

No. 15 examines and tests the telautograph.

If a telephone is provided, he puts on the head receiver and wears it until dismissed.

To Load and Fire.

341. *The chief of detachment* commands: 1. *No.* —, 2. *With shot* (*shell or dummy projectile*), 3. *LOAD*.

He commands *In battery* in time to add *TRIP* as soon as the breech is closed. When it is not desired to trip the gun the command *halt* is given instead of *trip*.

The piece being fully in battery and set for elevation, Case II, and for elevation and azimuth, Case III, he commands and signals *READY* as soon as the safety switch is closed.

The gun-pointer performs the duties prescribed in paragraph 230, 231, or 232, according to the method of pointing ordered.

He fires the piece electrically by closing the firing key and commands: 1. *No.* —, 2. *FIRE*, at the same time.

He both calls out and signals *azimuth set*, Case III, as the piece goes in battery, signaling by holding one hand at the height of the head until the signal *ready* is made by the chief of detachment.

The range-keeper calls the range to the elevating detail as often as necessary to keep the piece at the proper elevation and makes range corrections for gun difference when necessary. As the piece comes fully in battery (or as soon thereafter as practicable) he both calls out and signals *elevation set*, signaling by holding one hand at the height of his head until the signal *ready* is made by the chief of detachment. In restricted fire at a specified interval he keeps the time and indicates to the chief of detachment the proper time to trip the gun.

The breech is opened at the command *load*, if not already open (par. 211).

No. 1 examines the breechblock and gas check, wipes off any dirt found, oils the gas check and threads of the breechblock if there is difficulty in opening or closing the breech, assists in ramming the projectile, places the second section of cartridge on the shot tray, and closes the breech as soon as the truck is removed.

Immediately after the piece is fired he unhooks the safety lanyard from the eye of the firing leaf.

No. 2 examines the gas-check seat and threads of the breech recess, wipes off any dirt found, and oils the threads if they become dry. The truck being in position at the breech he commands: 1. ***Home,*** 2. ***RAM.*** He observes the scale on the rammer to make sure that the projectile is properly seated and places the first section of cartridge on the shot tray as soon as the rammer is withdrawn after ramming the projectile.

He pushes the second section of cartridge into the chamber by hand until its base barely clears the gas-check seat, a position from which it will be pushed into place by the mushroom head as the breech is closed, remain in contact with it and facilitate ignition.

If the loading tray is used, he seats it before the truck comes to its position at the breech, and takes it out and places it on the platform as soon as the truck is removed.

Immediately after the piece is fired and the breech opened he sponges the chamber, assisted by No. 10.

No. 3 inserts a primer in the vent at the command *load,* lowers the slide and takes the lanyard. As soon as the breech is closed he hooks the safety lanyard to the eye of the firing leaf. *The slide must be lowered entirely down;* otherwise the primer may be blown to the rear and endanger the lives of the men. At the command *trip* he steps back to a position in rear and slightly to the right of the piece. He pulls the lanyard at the command *fire,* given by the gun-pointer. The lanyard should be pulled with a strong quick pull—not a jerk.

Immediately after the piece is fired he coils the lanyard as he walks toward the piece. As soon as the breech is opened he removes the fired primer.

No. 4 at the command *load* seizes the rammer near its head, carries it around parallel to the piece, and as the truck comes to its position places the head of the rammer against the base of the projectile. He assists in ramming the projectile and first section of cartridge and withdraws the rammer and replaces it on its support.

No. 5, assisted by ***No. 6,*** keeps the elevation scale set for the indicated range.

Nos. 5 and 6 remain at their posts when the piece is fired.

Nos. 7 and ***8*** traverse the piece under the gun-pointer's direction and remain at their posts when the piece is fired.

Nos. 9 and ***10*** at the command *load* assist in ramming the projectile, and as soon as the projectile is seated, quit the rammer and return to their posts at the tripping levers.

At the command *in battery* they seize the tripping levers and at the command *trip* raise them to the full height and then release them.

If the gun fails to run fully in battery, they engage the pinch bars in the notches on the chassis and against the fulcrums on the top carriage and force the top carriage forward until it is fully in battery. No. 10 closes the safety switch as soon as the piece is in battery. They then go to their post at the rail.

Immediately after the piece is fired No. 10 brings up the chamber sponge, assists No. 2 in sponging, and replaces the sponge.

No. 11 at the command *load* brings up the truck loaded with a cartridge and a projectile of the kind designated. He adjusts the height of the shot tray for the height of the breech and places the truck in position for ramming as soon as No. 2 steps aside from the breech. He holds the truck until the second section of cartridge is placed on the shot tray and then runs it to the delivery table and takes post at a loaded truck.

No. 15 calls out and posts ranges and deflections or azimuths received.

No. 16 notifies the chief of the ammunition detachment what kind of projectile is required and when to start and stop the hoist to regulate the rate of delivery of ammunition.

Nos. 16 and *17* load two trucks with the kind of projectile first ordered and a third truck with the other kind on hand, that may be ordered, the first one only with a powder charge.

They load empty trucks returned by the truck detail with the kind of projectile last ordered.

Every time a truck with a powder charge is taken to the piece, they place another charge on the proper truck in time for the next round.

Ramming.—The men take positions at the rammer in the following order from front to rear: Nos. 1 and 9 on the right side, Nos. 4 and 10 on the left side, all facing the rammer and taking hold of it with both hands.

Nos. 9 and *10* take hold at the rear end of the rammer or as near the end as the rail will permit and the other numbers take hold as far to the rear as practicable without interfering with one another. The rammer head is placed against the base of the projectile as the truck nears the breech. At the command *home*, given the instant the projectile is in proper position, all the numbers take a firm hold and at the command *ram*, working together, they send the projectile home in one motion and with all force possible, taking two or three steps toward the breech. Nos. 1 and 4 withdraw the rammer until its head is clear of the shot tray.

As soon as the first section of the cartridge is placed on the shot tray No. 4 pushes it home without unnecessary force, without command, and withdraws the rammer.

To Unload a Dummy Charge.

342. The chief of detachment commands: ***UNLOAD.*** The breech is opened and No. 11 places the truck in position at the breech as for loading and holds it there while the charge is withdrawn.

No. 4 brings up the extractor and pulls the sections of cartridge from the chamber onto the shot tray one at a time.

No. 1 puts one section on the right cartridge tray of the truck and No. 2 puts the other section on the left cartridge tray.

Nos. 1 and 4 withdraw the projectile onto the truck.

No. 4 replaces the extractor, No. 11 removes the truck, and the breech is closed without command.

To Retract the Gun.

343. To bring the gun from the firing to the loading position the chief of detachment commands: 1. *From battery,* 2. ***HEAVE,*** 3. ***HALT.***

At the first command Nos. 7 and 8 go to the retraction cranks. No. 7 operates the retaining pawl and speed crank to permit the pulling out of the ropes. Nos. 9 and 10 mount on the gun levers and place the ends of the ropes on the hooks, receiving them from Nos. 3 and 4, who mount on the chassis to assist. Nos. 1 and 2 pull out the ropes and pass the ends to Nos. 3 and 4. No. 7 takes in the slack. Nos. 7, 8, 9, and 10 take positions at the retraction cranks and at the second command turn the cranks. Nos. 3, 4, 5, and 6 relieve Nos. 7, 8, 9, and 10 when directed by the chief of detachment. Odd numbers work on the right side of the carriage, even numbers on the left side. When the gun has reached the loading position the command *halt* is given. At the command *cast off* No. 7 lets out enough slack to enable Nos. 1 and 2 to take the rope ends off the hooks. (See pars. 305 and 311.)

To prevent injury to the ropes by reverse winding in letting out slack, the chief of detachment takes a position where he can see one of the drums and stops the unwinding before the last turn of the rope is off the drum.

To prevent injury to the ropes by winding across the grooves, No. 1 watches the right drum and No. 2 the left until the ropes are taut, and if either rope fails to wind in the proper groove the man at that side calls *halt,* when the winding is stopped and the rope guided into the proper groove, by No. 9 if on the right drum, by No. 10 if on the left. Taking in the slack is then resumed.

For Carriages Provided with Electric Motors.

344. Executed as prescribed in pars. 305 to 311.

Notes on the Drill of the Gun Detachment.

345. To facilitate the prompt and accurate cooperation of Nos. 5 and 6 in giving elevation, the chief of detachment may, during drill or action, direct both to work at the elevating wheel nearest the elevation scale in use.

To insure the prompt cooperation of Nos. 7 and 8 in following targets, the gun-pointer may, during drill or action, direct both to work at the traversing crank on the side of the carriage where they can see his signals.

Nos. 1 and 2 move away from the carriage when the gun is tripped, each on his own side.

The other members of the detachment remain at their posts. The gun-pointer and Nos. 3, 5, 6, 7, and 8 should have cotton in their ears.

The men without cotton in their ears should stop them with their fingers when the gun is fired.

When the hoist is on the right side of the emplacement the drill is changed as follows:

No. 9 brings up and replaces the sponge and assists in sponging instead of No. 10.

The members of the detachment must be trained to work together with the utmost celerity and precision and without interfering with one another.

When they become proficient the interval between the commands *load* and *trip* should not as a rule exceed twenty to twenty-five seconds when the primer is inserted while the breech is open, the charge being on a truck and the breech closed when the command *load* is given.

AMMUNITION DETACHMENT.

346. Chief of detachment (sergeant) and 10 privates assigned and numbered as follows:

Hoist detail, Nos. 1 and 2.
Projectile detail, Nos. 3, 4, 5, and 6.
Cartridge detail, Nos. 7, 8, 9, and 10.

Duties.

347. Each member of the detachment on reaching his post examines the material to which he is assigned and reports all defects he finds to the chief of detachment.

The chief of detachment exercises general supervision over the supply of ammunition and is responsible that the designated kind is delivered promptly and that all magazine regulations for safety are enforced, and that the directions for starting, stopping, and operating the hoist and motor are strictly followed. The directions will be kept posted near the motor.

No. 1 operates the controller. He starts the hoist as soon as a projectile is in position to be taken up by a carrier and then, guided by signals from the delivery table, operates the hoist to keep the delivery table supplied with ammunition.

No. 2 repeats the name of the projectile announced at the delivery table, sees that projectiles and cartridge sections are placed on the receiving table in the proper order and rolls them to the hoist carrier.

If the electric power fails, Nos. 1 and 2 place the hand cranks on the shaft and operate the hoist by hand. They are relieved by men from the reserve or by other numbers of the detachment in turn when directed by the chief of detachment.

Nos. 3 and *4* operate a trolley and differential pulley. No. 4 places the shell tongs over the gravity band on a projectile of the kind ordered, locks them, and then steadies them while No. 3 hoists until there is sufficient weight on the tongs to prevent their slipping, and then assists No. 3 in hoisting. They stop hoisting when the projectile reaches the proper height for the receiving table and run the trolley to the table, No. 3 pulling on the chains and No. 4 pushing on the tongs. No. 3 lowers the projectile onto the table, point toward the gun, and No. 4 removes the tongs. They then return the trolley for another projectile. In hoisting and lowering projectiles the men should keep the chain on which they pull in the plane of the sheave over which it passes.

Nos. 5 and *6* operate a second trolley and pulley, No. 5 performing the duties prescribed for No. 3 and No. 6 those for No. 4.

Nos. 7 and *8* uncase cartridges and Nos. 9 and 10 place the sections on the receiving table, so that full charges alternate with projectiles, as a rule, after the first two projectiles, a shot and a shell, have been sent up.

348. Where the hoist is not adapted to deliver cartridges without injuring them, they will be carried to the loading platform and placed on the trucks by the cartridge detail, and additional men will be assigned to the detail where the distance from the cartridge room to the loading platform renders it necessary.

DRILL FOR THE 12-INCH GUN.

(Mounted on nondisappearing carriage, in an emplacement with a chain hoist.)

GUN DETACHMENT.

349. Chief of detachment, gun-pointer, range-keeper, and 19 privates.

Name of detail.	Posts.
Chief of detachment (sergeant).	Two yards in rear of the loading platform, facing it.
Gun-pointer (duly qualified noncommissioned officer or private).	Sighting platform.
Range-keeper (noncommissioned officer or private).	On the left of the carriage, opposite the elevation scale
Breech detail (4 privates, Nos. 1, 2, 3, and 4).	Nos. 1 and 2 immediately in rear of the breech, Nos. 3 and 4 one yard in rear of Nos. 1 and 2, all facing the breech, odd numbers on the right.
Elevating detail (2 privates, Nos. 5 and 6).	At the elevating handwheels, facing them, No. 5 on the right of the carriage, No. 6 on the left.

GUN DETACHMENT—continued.

Name of detail.	Posts.
Traversing detail (2 privates, Nos. 7 and 8).	At the traversing cranks, facing the carriage, No. 7 on the right of the carriage, No. 8 on the left.
Sponge and rammer detail (2 privates, Nos. 9 and 10.)	One yard in rear of the loading platform, facing it, No. 9 on the right.
Shot-hoist detail (4 privates, Nos. 11, 12, 13, and 14).	No. 11 opposite the shot-hoist tackle, facing the carriage, Nos. 12 and 13 in rear of the windlass crank handle, facing it, No. 13 on the right, No. 14 in front of the windlass crank handle, facing it.
Truck detail (2 privates, Nos. 15 and 16).	Near the hoist, in rear of a loaded truck, No. 15 on the right.
Telautograph detail (1 private, No. 17).	At the telautograph.
Hoist detail (2 privates, Nos. 18 and 19).	At the delivery table and facing it.

The posts of the gun detachment as given above are for inspection, and preparatory to the service of the gun.

The men resume their posts on completion of any duty requiring them elsewhere.

The chief of detachment and gun-pointer go wherever their presence is necessary.

Duties.

350. *The gun commander* repeats the commands *commence firing* and *cease firing,* announces the kind of projectile to be used, the order of fire, the method of pointing, and, in restricted fire, the number of shots and the firing interval, all in accordance with the orders of the battery commander.

For general duties see pars. 67, 68, 69, 244, 245, 253, 254, and 293.

The chief of detachment is responsible that the general instructions given in paragraphs 209 to 226, inclusive, are carried out.

For general duties see par. 244.

The gun-pointer.—For general duties see pars. 230 to 235, inclusive.

No. 2 is chief of the breech detail. For general duties see par. 244.

No. 18 is chief of the hoist detail. For general duties see par. 244.

Equipments and Implements.

351. *The gun-pointer* procures the sight and difference chart, places the sight in its seat on the sight standard and the chart in a convenient place for use in Case III.

The range-keeper equips himself with a stop watch.

No. 1 procures the translating roller (or crank for model 1895 mechanism), the lanyard, and a can containing a hand sponge and lubricating oil for the threads of the breechblock and breech recess, places the roller (or crank) in position, and the can and lanyard convenient to the breech.

He carries a silk wiper or cotton waste in his belt.

No. 2 procures the loading tray and places it convenient to the breech.

He equips himself with the primer pouch and attaches the holder containing the punch, gimlet, and reamer to the railing of the loading platform.

He carries a silk wiper or cotton waste in his belt.

No. 5 procures a wrench for filling plugs, a funnel, and a measure containing oil for filling the recoil cylinders, and places them convenient to his post.

No. 6 procures a wrench for filling plugs and places it convenient to his post.

No. 9 procures the rammer and prop and places them convenient to his post.

No. 10 procures the chamber sponge and places it on the prop in rear of the carriage platform.

No. 11 procures the extractor for the dummy charge at drill, and places it on the platform against the rail posts in rear of the piece.

Nos. 15 and *16* bring the trucks from their recesses to the delivery table.

Opening and Closing the Breech.

352. With model 1888 mechanism the breechblock must not be swung open when the piece has an elevation of more than 1 degree and the piece must not be elevated while the breech is open.

The breech is opened and closed as prescribed in paragraph 300.

To Examine Gun.

353. Each member of the detachment reports all defects he finds to the chief of detachment.

The chief of detachment inspects the gun and carriage to see if all parts are in good order and the bearings well lubricated and examines the gas check to see if it is properly adjusted. He inspects the firing attachments and tests the electric firing circuit. On completion of the examination he directs the breech to be closed and reports the condition of the piece to the gun commander.

The gun-pointer inspects the sight, tests the sight standard and azimuth subscale for adjustment, and inspects and tests the traversing gear and firing key.

The range-keeper inspects the elevating gear.

No. 1 removes the breech cover and passes it to No. 9, who places it out of the way. The breech is opened and No. 1 then examines the breechblock and the breech mechanism, cleans them if necessary, and oils all the bearing parts and the threads of the breechblock

He assists in sponging the bore when it is necessary to clean it.

He frees the lanyard of kinks, coils it, beginning at the loop end, and hangs it on a hook outside the platform rail in front of the right steps.

No. 2 examines the bore, chamber, gas-check seat, and breech recess, cleans them if necessary, oils the threads of the breech recess, clears the vent, removing all water, oil, and other obstructions, and wipes the primer seat clean.

If the bore or chamber needs cleaning, he calls for the sponge and assists in sponging.

Nos. 3 and *4* assist in sponging the bore when it is necessary to clean it.

Nos. 5 and *6* mount on the chassis, each carrying a plug wrench. They remove the filling plugs from both recoil cylinders and ascertain if they contain the proper amount of oil. It is necessary that both cylinders be open when filling is done to avoid the formation of an air cushion. If oil is required, No. 5 calls on No. 9 for the funnel and oil measure, pours oil into the filling hole of one cylinder until the oil reaches the proper level in both cylinders, and passes the funnel and measure back to No. 9, who replaces them. Nos. 5 and 6 replace the filling plugs, screw them well home, replace the wrenches, resume their posts, and test the elevating gear under the direction of the range-keeper.

They leave the piece depressed 1 degree and 15 minutes.

Nos. 7 and ***8*** test the traversing gear under direction of the gun-pointer.

No. 9 passes up and replaces the funnel and oil measure when necessary.

No. 10 passes up and replaces the sponges when necessary.

Nos. 11 and ***12*** remove the muzzle cover and place it out of the way and examine the tackle.

Nos. 13 and ***14*** examine the hoisting gear.

Nos. 15 and ***16*** examine the trucks and clean and oil them if necessary.

No. 17 examines and tests the telautograph.

If a telephone is provided, he puts on the head receiver and wears it until dismissed.

To Load and Fire.

354. ***The chief of detachment*** commands: 1. ***No. —***, 2. ***With shot*** (***shell or dummy projectile***), 3. ***LOAD.***

The piece being loaded and set for elevation, Case II, and for elevation and azimuth, Case III, he commands and signals ***READY.***

The gun-pointer performs the duties prescribed in paragraph 230, 231, or 232, according to the method of pointing ordered.

He fires the piece electrically by closing the firing key, and commands: 1. ***No. —***, 2. ***FIRE,*** at the same time.

He both calls out and signals ***azimuth set,*** Case III, signaling by holding one hand at the height of the head until the signal ***ready*** is made by the chief of detachment.

The range-keeper calls the range to the elevating detail as soon as the breechblock is swung to the left. He makes range corrections for gun difference when necessary. He both calls out and signals ***elevation set,*** signaling by holding one hand at the height of his head until the signal ready is made by the chief of detachment. In restricted fire at a specified interval he keeps the time and indicates to the gunner the proper time to fire.

The breech is opened at the command *load*, if not already open (par. 211).

No. 1 examines the breechblock and gas check, wipes off any dirt found, oils the gas check and threads of the breechblock if there is difficulty in opening or closing the breech, assists in ramming the projectile, inserts the first and third sections of the cartridge, closes the breech as soon as the loading tray is removed, hooks the lanyard to the eye of the firing leaf, dismounts, and takes position to the rear and right of the loading platform. He pulls the lanyard at the command *fire* given by the gun-pointer. The lanyard should be pulled with a strong, quick pull—not a jerk—from a position in rear and slightly to one side of the gun.

No. 2 examines the gas-check seat and threads of the breech recess, wipes off any dirt found, and oils the threads if they become dry.

He inserts the loading tray, swings the projectile into position at the breech and the shot tray back after the projectile is launched on the loading tray, gives the commands for ramming, assists in ramming the projectile, observes the scale on the rammer to make sure that the projectile is properly seated, and inserts the second and fourth sections of cartridge.

He pushes the last section of cartridge into the chamber by hand until its base barely clears the gas-check seat, a position from which it will be pushed into place by the mushroom head as the breech is closed, remain in contact with it, and facilitate ignition.

He then removes the loading tray and, as soon as the breech is closed, inserts a primer and lowers a slide. *The slide must be lowered entirely down;* otherwise the primer may be blown to the rear and endanger the lives of the men.

Immediately after the piece is fired he removes the fired primer and, as soon as the breech is opened, sponges the chamber, assisted by No. 4.

No. 3 receives the rammer and places its head against the base of the projectile, assists in ramming the projectile and first three sections of cartridge, and passes the rammer back to No. 9.

No. 4 assists in ramming the projectile and first three sections of cartridge. Immediately after the piece is fired he receives the chamber sponge, assists in sponging, and passes the sponge back to No. 10.

Nos. 5 and ***6*** elevate the gun for the indicated range.

Immediately after the gun is fired they give it a depression of one degree and fifteen minutes.

Nos. 7 and *8* traverse the gun under the gun-pointer's direction. They assist in depressing the piece if necessary.

No. 8 closes the safety switch at the command *ready.*

No. 9 passes the rammer to No. 3, mounts on the loading platform, assists in ramming the projectile, resumes his post, receives and replaces the rammer.

No. 10 mounts on the loading platform, assists in ramming the projectile, and resumes his post.

Immediately after the gun is fired he passes the chamber sponge to No. 4, receives it back and replaces it.

No. 11 hooks the tackle to a shot tray, commands ***HOIST,*** steadies the projectile as it rises, mounts the steps with it, commands ***HALT*** when the projectile is at the height of the breech, and assists in swinging the projectile around to the breech and the shot tray back clear of the loading platform. He commands ***LOWER,*** guides the shot tray on to the truck and unhooks the tackle.

Nos. 12 and *13* assist in hoisting the projectile, and then assist in passing the sections of cartridge to Nos. 1 and 2.

No. 14 assists in hoisting the projectile, lowers the shot tray, and attends to the pawl.

Nos. 15 and *16* bring up a loaded truck, assist in passing the sections of cartridge to Nos. 1 and 2, and then return the truck to the delivery table. No. 15 is responsible that the designated kind of projectile is brought up.

No. 17 calls out and posts ranges and deflections or azimuths received.

No. 18 notifies the chief of the ammunition detachment what kind of projectile is required and when to start and stop the hoist to regulate the rate of delivery of ammunition.

Nos. 18 and *19* load two trucks with the kind of projectile first ordered and a third truck with the other kind on hand that may be ordered, the first one only with a powder charge.

They load empty trucks returned by the truck detail with the kind of projectile last ordered.

Every time a truck with a powder charge is taken to the piece they place another charge on the proper truck in time for the next round.

Ramming.—The men take positions at the rammer in the following order from front to rear: Nos. 1, 3, and 9 on the right side, Nos. 2, 4, and 10 on the left side, all facing the rammer and taking hold of it with both hands.

Nos. 9 and *10* take hold as far to the rear as the rail will permit, and the other numbers take hold as far to the rear as practicable without interfering with one another.

The projectile is forced into the bore by successive efforts at the command *ram,* repeated by No. 2, until the scale on the rammer staff is about 2 feet from the face of the breech, when No. 2 commands: 1. *Home,* 2. ***RAM.*** At the command *home* all the numbers take a firm hold, and at the command *ram,* working together, they send the projectile home in one motion and with all force possible. All quit the rammer except Nos. 3 and 4, who withdraw it.

As soon as three sections of the cartridge are inserted Nos. 3 and 4 push them home without command and then withdraw the rammer.

To Unload a Dummy Charge.

355. The chief of detachment commands: ***UNLOAD.***

The gun is brought to zero degrees elevation and the breech opened. No. 10 passes the extractor to No. 4, who withdraws the sections of cartridge; Nos. 1 and 2 pass the sections to Nos. 12 and 13, who place them on the truck. The shot tray is run up and swung into position at the breech as in loading. Nos. 1, 2, 3, and 4 withdraw the projectile onto the shot tray and swing it clear of the loading platform. The shot-hoist detail lower the projectile onto the truck, and No. 11 unhooks the tackle.

The gun is depressed to the loading position and the extractor is replaced by No. 10.

Notes on the Drill of the Gun Detachment.

356. *The chief of detachment* causes Nos. 1 and 2 to exchange places with Nos. 3 and 4 when necessary to prevent the men from becoming unduly fatigued.

To facilitate the prompt and accurate cooperation of Nos. 5 and 6 in giving elevation, the chief of detachment may, during drill or action, direct both to work at the same elevating wheel.

To insure the prompt cooperation of Nos. 7 and 8 in following targets, the gun-pointer may, during drill or action, direct both to work at the traversing crank on the side of the carriage where they can see his signals.

The gun-pointer and Nos. 5, 6, 7, and 8 remain at their posts when the gun is fired and should have cotton in their ears. The other men move away from the carriage at the command *ready*.

The men without cotton in their ears should stop them with their fingers when the gun is fired.

The members of the detachment must be trained to work together with the utmost celerity and precision and without interfering with one another.

AMMUNITION DETACHMENT.

357. As prescribed in pars. 318 to 320.

358. Where there is no chain ammunition hoist the drill will be modified as may be necessary to suit the means provided for handling ammunition.

DRILL FOR THE 10-INCH GUN.

(Mounted on nondisappearing carriage, in an emplacement with a chain hoist.)

359. The same as prescribed for the 12-inch gun, pars. 349 to 358, with the following modifications:

Only Nos. 1, 2, 3, and 4 man the rammer.

The sponge and rammer detail consists of but one man, No. 9.

The truck detail consists of but one man, No. 10.

The cartridge detail of the ammunition detachment consists of four men.

DRILL FOR THE 8-INCH GUN.

(Mounted on nondisappearing carriage, in an emplacement with a chain hoist.)

GUN DETACHMENT.

360. Chief of detachment, gun-pointer, range-keeper, and 15 privates.

Name of detail.	Posts.
Chief of detachment (sergeant).	Two yards in rear of the carriage, facing it.
Gun-pointer (duly qualified noncommissioned officer or private).	Sighting platform.

GUN DETACHMENT—continued.

Name of detail.	Posts.
Range-keeper (noncommissioned officer or private).	On the left of the carriage, opposite the elevation scale.
Breech detail (2 privates, Nos. 1 and 2).	In line, immediately in rear of the breech, facing it, No. 1 on the right.
Elevating detail (2 privates, Nos. 3 and 4).	At the elevating handwheels, facing them, No. 3 on the right of the carriage, No. 4 on the left.
Traversing detail (2 privates, Nos. 5 and 6).	In front of the traversing cranks, facing from the parapet, No. 5 on the right of the carriage, No. 6 on the left.
Shot-hoist detail (4 privates, Nos. 7, 8, 9, and 10).	Nos. 7 and 8 at the windlass cranks, facing to the rear, No. 7 on the right of the carriage, No. 8 on the left, No. 9 opposite the shot-hoist tackle, facing the carriage, No. 10 at the foot of the steps to the carriage platform, on the left of the carriage, facing it.
Sponge and rammer detail (1 private, No. 11).	One yard in rear of the carriage, facing it.
Truck detail (1 private, No. 12).	Near the hoist, in rear of a loaded truck.
Telautograph detail (1 private, No. 13).	At the telautograph.
Hoist detail (2 privates, Nos. 14 and 15).	At the delivery table, facing it.

The posts of the gun detachment as given above are for inspection and preparatory to the service of the gun.

The men resume their posts on completion of any duty requiring them elsewhere.

The chief of detachment and gun-pointer go wherever their presence is necessary.

Duties.

361. *The gun commander* repeats the commands *commence firing* and *cease firing,* announces the kind of projectile to be used, the order of fire, the method of pointing, and, in restricted fire, the number of shots and the firing interval, all in accordance with the orders of the battery commander.

For general duties see pars. 67, 68, 69, 244, 245, 253, 254, and 293.

The chief of detachment is responsible that the general instructions given in pars. 209 to 226 inclusive are carried out.

For general duties see par. 244.

The gun-pointer.—For general duties see pars. 230 to 235, inclusive.

No. 2 is chief of the breech detail. For general duties see par. 244.

No. 14 is chief of the hoist detail. For general duties see par. 244.

Equipments and Implements.

362. *The gunner* procures the sight and difference chart, places the sight in its seat on the sight standard and the chart in a convenient place for use in Case III.

The range-keeper equips himself with a stop watch.

No. 1 procures the translating roller, the lanyard, and a can containing a hand sponge and lubricating oil for the threads of the breechblock and breech recess, places the roller in position, and the can and lanyard convenient to the breech.

He carries a silk wiper or cotton waste in his belt.

No. 2 procures the loading tray and places it convenient to the breech.

He equips himself with the primer pouch, and attaches the holder containing the punch, gimlet, and reamer to the railing of the loading platform.

He carries a silk wiper or cotton waste in his belt.

No. 5 procures a wrench for filling plugs, a funnel, and a measure containing oil for filling the recoil cylinders, and places them convenient to his post.

No. 6 procures a wrench for filling plugs and places it convenient to his post.

No. 9 procures the chamber sponge and places it on the prop in rear of the carriage platform.

No. 10 procures the extractor for the dummy charge and places it on the platform against the rail posts in rear of the piece.

No. 11 procures the rammer and prop and places them convenient to his post.

No. 12 brings the trucks from their recesses to the delivery table.

Opening and Closing the Breech.

363. With model 1888 mechanism the breechblock must not be swung open when the piece has an elevation greater than zero degrees, and the piece must not be elevated while the breech is open.

The breech is opened and closed as prescribed in par. 300.

To Examine Gun.

364. Each member of the detachment reports all defects he finds to the chief of detachment.

The chief of detachment inspects the gun and carriage to see if all parts are in good order and the bearings well lubricated and examines the gas check to see if it is properly adjusted. He inspects the firing attachments and tests the electric firing circuit. On completion of the examination he directs the breech to be closed and reports the condition of the piece to the gun commander.

The gun-pointer inspects the sight, tests the sight standard and azimuth subscale for adjustment, and inspects and tests the traversing gear and firing key.

The range-keeper inspects the elevating gear.

No. 1 removes the breech cover and passes it to No. 11, who places it out of the way. The breech is opened and No. 1 then examines the breechblock and breech mechanism, cleans them if necessary, and oils all the bearing parts and the threads of the breechblock. He assists in sponging the bore when it is necessary to clean it.

No. 2 examines the bore, chamber, gas-check seat, and breech recess, cleans them if necessary, oils the threads of the breech recess, clears the vent, removing all water, oil, and other obstructions, and wipes the primer seat clean.

If the bore or chamber needs cleaning, he calls for the sponge and assists in sponging.

Nos. 3 and *4* test the elevating gear under direction of the range-keeper and leave the piece at zero degrees elevation.

Nos. 5** and **6 mount on the chassis, each carrying a plug wrench. They remove the filling plugs from both recoil cylinders and ascertain if they contain the proper amount of oil. It is necessary that both cylinders be open when filling is done to avoid the formation of an air cushion. If oil is required, No. 5 calls on No. 7 for the funnel and oil measure, pours oil into the filling hole of one cylinder until the oil reaches the proper level in both cylinders and passes the funnel and measure back to No. 7, who replaces them. Nos. 5 and 6 replace the filling plugs, screw them well home, and then replace the wrenches, resume their posts, and test the traversing gear under direction of the gunner.

No. 7 passes up and replaces the funnel and oil measure when used.

No. 8 examines the hoisting gear and removes the muzzle cover.

Nos. 9** and **10 examine the tackle.

No. 11 passes up and replaces the sponges when they are used.

No. 12 examines the trucks and cleans and oils them if necessary.

No. 13 examines and tests the telautograph.

If a telephone is provided, he puts on the head receiver and wears it until dismissed.

To Load and Fire.

365. ***The chief of detachment*** commands: 1. ***No.*** —, 2. ***With shot*** (***shell or dummy projectile***), 3. ***LOAD.***

The piece being loaded and set for elevation, Case II, and for elevation and azimuth, Case III, he commands and signals ***READY.***

The gun-pointer performs the duties prescribed in paragraph 230, 231, or 232, according to the method of pointing ordered.

He fires the piece electrically by closing the firing key, and commands: 1. ***No.*** —, 2. ***FIRE,*** at the same time.

He both calls out and signals ***azimuth set,*** Case III, signaling by holding one hand at the height of the head until the signal ***ready*** is made by the chief of detachment.

The range-keeper calls the range to the elevating detail as soon as the breechblock is swung to the left. He makes range corrections for gun difference when necessary. He both calls out and signals ***elevation set,*** signaling by holding one hand at the height of his head until the signal ***ready*** is made by the chief of detachment. In restricted fire at a specified interval he keeps the time and indicates to the gun-pointer the proper time to fire.

The breech is opened at the command ***load,*** if not already open (pars. 211 and 363).

No. 1 examines the breechblock and gas check, wipes off any dirt found, oils the gas check and threads of the breechblock if there is difficulty in opening or closing the breech, assists in launching the projectile onto the loading tray, assists in ramming the projectile and passes the rammer to No. 11, closes the breech as soon as the loading tray is removed, hooks the lanyard to the eye of the firing leaf, and steps back to a position in rear and slightly to the right of the piece. He pulls the lanyard at the command *fire* given by the gun-pointer. The lanyard should be pulled with a strong quick pull—not a jerk.

No. 2 examines the gas-check seat and threads of the breech recess, wipes off any dirt found, oils the threads if they become dry, and inserts the loading tray. The projectile having been launched on the loading tray, he places the rammer head against its base and commands: 1. *Home,* 2. ***RAM.*** He assists in ramming, observes the scale on the rammer to make sure that the projectile is properly seated, and then inserts the sections of cartridge.

He pushes the sections of cartridge into the chamber by hand, the second section until its base barely clears the gas-check seat, a position from which it will be pushed into place by the mushroom head as the breech is closed, remain in contact with it and facilitate ignition. He then removes the loading tray, places it on the platform and, as soon as the breech is closed, inserts a primer and lowers the slide. *The slide must be lowered entirely down;* otherwise the primer may be blown to the rear and endanger the lives of the men.

Immediately after the piece is fired he removes the fired primer and, as soon as the breech is opened, sponges the chamber.

Nos. 3 and ***4*** elevate the gun for the indicated range.

Immediately after the piece is fired they give it an elevation of zero degrees.

Nos. 5 and ***6*** traverse the piece under the gun-pointer's direction.

Nos. 7 and ***8*** hoist the projectile at the command *hoist.* No. 8 lowers the shot tray as soon as it is swung back from the breech.

No. 9 hooks the tackle to the shot tray, commands ***HOIST,*** steadies the projectile as it is hoisted, and then takes a section of cartridge from the truck and places it on the rear end of the carriage platform. He places the empty shot tray on the truck and unhooks the tackle.

No. 10 mounts on the carriage platform, commands ***HALT*** when the projectile reaches the height of the breech, swings the projectile around to the breech, launches it on the loading tray assisted by No. 1, swings the shot tray back clear of the carriage platform and resumes his post.

No. 11 passes the rammer to No. 2, and then gets a cartridge from the truck. As soon as the projectile is rammed he passes both sections of cartridge to No. 2 and then receives the rammer from No. 1 and replaces it on the prop.

No. 12 runs loaded trucks under the crane and returns empty trucks to the delivery table.

No. 13 calls out and posts ranges and deflections or azimuths received.

No. 14 notifies the chief of the ammunition detachment what kind of projectile is required and when to start and stop the hoist to regulate the rate of delivery of ammunition.

Nos. 14 and *15* load two trucks with the kind of projectile first ordered and a third truck with the other kind on hand, that may be ordered, the first one only with a powder charge.

They load empty trucks returned by the truck detail with the kind of projectile last ordered.

Every time a truck with a powder charge is taken to the piece, they place another charge on the proper truck in time for the next round.

To Unload a Dummy Charge.

366. *The chief of detachment* commands: *UNLOAD.*

The gun is brought to zero degrees elevation and the breech opened. No. 11 passes up the extractor, No. 2 withdraws the sections of cartridge, and No. 10 passes them to No. 11, who places them on the truck. The shot tray is held in position while No. 2 withdraws the projectile and it is then swung clear of the loading platform. The shot-hoist detail lowers the projectile, No. 9 guides it onto the truck and unhooks the tackle. The extractor is replaced by No. 11.

Notes on the Drill of the Gun Detachment.

367. To insure the prompt cooperation of Nos. 7 and 8 in following targets the gun-pointer may, during drill or action, direct both to work at the traversing crank on the side of the carriage where they can see his signals.

The members of the detachment remain at their posts when the gun is fired. The gun-pointer and Nos. 1, 3, 4, 5, and 6 should have cotton in their ears.

The men without cotton in their ears should stop them with their fingers when the gun is fired.

The members of the detachment must be trained to work together with the utmost celerity and precision and without interfering with one another.

AMMUNITION DETACHMENT.

368. As prescribed in pars. 346 to 348.

369. Where there is no chain ammunition hoist the drill will be modified as may be necessary to suit the means provided for handling ammunition.

DRILL FOR 12-INCH MORTAR.

(Carriage, Model 1896.)

GUN DETACHMENT.

370. Chief of detachment, gun-pointer, and 10 privates.

Name of detail.	Posts.
Chief of detachment (sergeant).	Two yards in rear of the breech, facing it.
Gun-pointer (duly qualified corporal or private).	Near the azimuth subscale, facing the mortar.
Breech detail (2 privates, Nos. 1 and 2).	In line immediately in rear of the breech, facing it, No. 1 on the right.
Sponge and rammer detail (2 privates, Nos. 3 and 4).	At the sponge and rammer, facing the mortar.
Elevating detail (2 privates, Nos. 5 and 6).	At the elevating handwheels, facing them, No. 5 on the right of the carriage, No. 6 on the left.
Traversing detail (2 privates, Nos. 7 and 8).	At the traversing cranks, facing the mortar, No. 7 at the right crank, No. 8 at the left.
Truck detail (2 privates, Nos. 9 and 10).	In the gallery, near the entrance, in rear of and facing a loaded truck, No. 9 on the right, No. 10 on the left.

The posts of the gun detachment as given above are for inspection and preparatory to the service of the mortar.

The men resume their posts on completion of any duty requiring them elsewhere.

The chief of detachment and gun-pointer go wherever their presence is necessary.

Duties.

371. *The gun commander* has charge of the switches in the outlet box and at the firing battery and is responsible that they are at all times properly set. He carries the firing plug suspended from his neck by a cord and is responsible that it is never in its socket except as prescribed for firing and that it is not inserted until every one in the pit has taken cover.

He tests the electric firing circuit before reporting the pit in order. For general duties see pars. 67, 68, and 69.

The chief of detachment is responsible that the general instructions given in pars. 209 to 226, inclusive, are carried out.

He directs the elevating detail, as a rule by signals, giving commands only as often and as loud as necessary. For general duties see pars. 264, 265, 268, 271, and 272.

The gun-pointer directs the traversing detail, as a rule by signals, giving commands only as often and as loud as necessary.

Equipments and Implements.

372. *No. 1* procures a can containing a hand sponge and lubricating oil for the threads of the breechblock and breech recess and places it convenient to the breech. He procures a silk wiper or cotton waste, which he carries in his belt.

No. 2 procures a silk wiper or cotton waste, which he carries in his belt. Where there is no rack for the sponge and rammer he places the prop in a convenient position.

No. 3 procures the long lanyard, places it convenient to the breech, and places the bore and chamber sponge on the rack (or prop) where it will be convenient for use and out of the way of the truck.

No. 4 places the rammer on the rack (or prop) where it will be convenient for use and out of the way of the truck.

No. 5 procures a plug wrench and places it convenient to his post.

No. 6 procures a plug wrench, funnel, and measure of oil for the cylinders, and places them convenient to his post.

No. 8 equips himself with the primer pouch and places the holder, containing punch, gimlet, and reamer, convenient to the piece.

Opening and Closing the Breech.

373. *To open the breech: The mortar must be locked or clamped in a horizontal position.* No. 1 releases the rotating crank by pulling on the winged nut and then turns the rotating crank clockwise, as indicated by the "open" arrow, till the crank brings up short in a vertical position. No. 2 turns the translating crank briskly contraclockwise and the block slides back along the rails of the console. When the groove shoulders strike against the ends of these rails, the block stops short and the shock frees the console latch from its catch. Nos. 1 and 2 then swing console and block to the right of the mortar till the securing latch engages in the catch. If while the translating roller is turning, the latch of the console fails to work, it must be pushed into place by hand.

To close the breech: No. 2 releases the securing latch from its catch and, assisted by No. 1, swings the console and block around to the left until the console abuts against and is latched to the face of the breech. No. 2 then turns the translating crank clockwise till it brings up in a vertical position, against the console. No. 1 turns the rotating crank contraclockwise as indicated by the "close" arrow till it brings up short and is secured by its catch.

To Examine Gun.

374. Each member of the detachment reports all defects he finds to the chief of detachment.

The chief of detachment inspects the mortar, carriage, and firing attachments to see if all parts are in good order, and examines the gas check to see if it is properly adjusted. On completion of the examination he directs the breech to be closed and reports the condition of the piece to the gun commander.

The gun-pointer inspects the azimuth subscale for adjustment and directs the traversing detail in testing the traversing gear.

The breech is opened as soon as the mortar is locked in the loading (horizontal) position.

No. 1 examines the breechblock and breech mechanism, cleans them if necessary, oils all the bearing parts and the threads of the breechblock, and assists in sponging.

No. 2 examines the bore, chamber, gas-check seat, and breech recess, cleans them if necessary, and oils the threads of the breech recess.

If the bore or chamber needs cleaning, he calls for the sponge and assists in sponging.

No. 3 frees the lanyard of kinks, coils it, beginning at the loop end, lays it on the platform near the breech with the last coil on top and the hook over to one side of the coil so that it may be picked up without tangling the lanyard. He brings up the sponge when it is called for, assists in sponging, and replaces the sponge.

No. 4 removes the muzzle cover and places it out of the way.

Nos. 5 and *6* test the elevating gear under direction of the chief of detachment and then take out the filling plugs of both recoil cylinders and ascertain if they contain the proper amount of oil. No. 5 works at the right cylinder and No. 6 at the left. It is necessary that both cylinders be open when any filling is done to avoid the formation of an air cushion. If the cylinders require oil, No. 6 puts in the necessary amount and returns the funnel and measure to the storeroom. They replace the filling plugs, screwing them well home, and replace the wrenches.

Nos. 7 and *8* test the traversing gear under direction of the gun-pointer. No. 7 then takes post at the door of the cartridge room and No. 8 clears the vent, removing all water, oil, and other obstructions and wipes the primer seat clean.

Nos. 9 and *10* examine the truck to see if it is in good order and then place it in the gallery in proper position for loading it. Trucks enter the gallery handles foremost and in the following order: First the truck that has the shortest distance to travel from the entrance of the gallery to the mortar; second, the truck that has the next greater distance to travel, and so on.

To Load and Fire.

375. *The battery commander* designates the kind of projectile and orders or signals: *Commence firing.*

With a fixed target the mortars are fired when *ready;* with a moving target they are fired when the target reaches a predicted position, or the order *relay* is then given.

The firing is generally done electrically and, as a rule, at a signal from the battery commander's, or primary, station.

The signal *ready* given by the emplacement officer is immediately transmitted to the battery commander's, or primary, station.

A single mortar of a pit may be fired by lanyard.

The *emplacement officer* at the order or signal *commence firing* commands: *LOAD.*

If the loading of any mortar is delayed so that it can not be fired at the proper time, to clear the pit, he commands: *No.* —, *Take cover* (giving the number of the mortar).

When all the detachments have taken cover he commands and signals: *READY.*

He observes the mortars and as soon as they are fired commands *POSTS,* or when any mortar misses fire, *No.* —, *Relay. POSTS.*

When the lanyard is used he commands *fire* at the firing signal.

The gun commander observes all the detachments; if the command *No.* —, *Take cover,* be given, he immediately cuts that mortar out of the firing circuit by opening the proper switch; when all have taken cover he inserts the firing plug in its socket.

As soon as the mortars are fired, or if the command *relay* or *withdraw cartridge* be given, he withdraws the firing plug.

The chief of detachment causes the mortar to be set at its approximate elevation as soon as the breech is closed and at its correct elevation as soon as the latter is announced.

The piece being laid he signals *ready* and takes cover.

He observes the muzzle of his mortar and if the piece misses fire he calls out, *No.* —, *missfire.* (See pars. 219 and 220.)

If the detachment is ordered to take cover before the mortar is laid, he directs the primer to be removed by No. 2 or No. 8, according as the breech is closed or open.

If the breechblock is not closed and locked, he directs the cartridge to be returned to the magazine and the breech to be left open.

If the breechblock has already been closed and locked, he directs the mortar to be elevated at least 45 degrees.

He then repeats the command for taking cover.

The gun-pointer causes the mortar to be set to its approximate azimuth as soon as the truck is removed from the breech and to the correct azimuth as soon as it is announced. He assists in traversing the piece when necessary while No. 7 or No. 8 is performing other duty. He signals *azimuth set* by holding one hand at the height of the head until the signal *ready* is made.

The breech is opened at the command *load*, if not already open (par. 211).

No. 1 examines the breechblock and gas check, wipes off any dirt found, oils the gas check and threads of the breechblock if there is difficulty in opening or closing the breech, and assists in ramming and closing the breech.

No. 2 examines the gas-check seat and threads of the breech recess, wipes off any dirt found, and oils the threads if they become dry. The truck being in position at the breech he commands: 1. ***Home***, 2. ***RAM***. He assists in ramming, observes the scale on the rammer to make sure that the projectile is properly seated, pushes the cartridge from the truck into the chamber by hand until its base barely clears the gas-check seat, releases the console latch, and assists in closing the breech.

Immediately after the mortar is fired and the breech opened he sponges the chamber, assisted by No. 3.

No. 3 assists in ramming and, when the mortar is to be fired by lanyard, attaches the long lanyard to the short one and *after the piece is elevated* hooks the short lanyard to the eye of the firing leaf and stands ready to pull the lanyard.

He pulls the lanyard with a strong, quick pull—not a jerk—at the command *fire*.

Immediately after the mortar is fired he brings up the bore and chamber sponge, assists No. 2 in sponging, and replaces the sponge.

No. 4 at the command *load*, seizes the rammer, and, as the truck comes to its position, places the head of the rammer against the base of the projectile. He assists in ramming the projectile, withdraws the rammer, and replaces it on its support.

Nos. 5 and ***6*** give elevation under direction of the chief of detachment, No. 5 operating the clamp and lock. They assist in ramming, returning to their posts as soon as the projectile is seated.

Immediately after the mortar is fired they bring the mortar to the horizontal position without command.

No. 7 brings the cartridge, places it on the truck, and takes his post at the traversing crank.

No. 8 inserts a primer in the vent, lowers the slide, and resumes his post. The slide must be lowered entirely down.

Nos. 7 and ***8*** traverse the mortar under the gun-pointer's direction.

Immediately after the mortar is fired No. 8 traverses it to the loading position when necessary, removes the fired primer, and resumes his post.

Nos. 9 and *10* bring up a loaded truck, hold it in position against the face of the breech until the projectile is rammed and the cartridge pushed into the chamber, and then return the truck to the gallery and take post at the proper loaded truck.

As soon as the mortar is fired they run the truck near it and wait for the command *load.*

Ramming.—Where the rack or prop is on the right or in rear of the piece the men take positions at the rammer in the following order from front to rear: Nos. 1, 3, and 5 on the right side, Nos. 2, 4, and 6 on the left side, all facing the rammer and taking hold of it with both hands; where the rack or prop is on the left of the piece they take the same positions, except that No. 3 is between Nos. 2 and 4, and No. 4 is between Nos. 1 and 5.

Nos. 5 and *6* take hold at the rear end of the rammer and the other numbers take hold as far to the rear as practicable without interfering with one another. At the command *home,* given the instant the projectile is in proper position, all the numbers take a firm hold and at the command *ram,* working together, they send the projectile home in one motion and with all force possible.

No. 4 withdraws and replaces the rammer.

Taking cover.—Each chief of detachment takes cover in a position from which he can observe his mortar and determine whether or not it misses fire.

Nos. 9 and *10* are under cover in the shot gallery. The other numbers observe the chief of detachment and take cover at the signal *ready.* No. 7 takes cover at the door of the cartridge room; in closed pits the others take cover in the gallery; in pits open to the rear they take cover as indicated in the following diagram:

Mortar No. 4.		Mortar No. 2.	
Mortar No. 3.		Mortar No. 1.	
4th detachment	8, 6, 5, G, 4, 3, 2, 1.	2d detachment	8, 6, 5, G, 4, 3, 2, 1.
3d detachment	8, 6, 5, G, 4, 3, 2, 1.	1st detachment	8, 6, 5, G, 4, 3, 2, 1.

To Relay the Mortar.

376. At the order or signal *relay*, new data are announced.

When a different cartridge is announced the emplacement officer commands: *Withdraw cartridge;* if different elevation and azimuth only are given, he commands: *Relay.*

In both cases the chief of detachment, gun-pointer, and Nos. 5 and 8 return to the mortar; in the first case Nos. 1, 2, and 6 also return and the cartridge is changed, No. 2 withdrawing the cartridge, No. 7 bringing up and inserting the proper one and then carrying the one withdrawn to the magazine; in both cases the mortar is then laid, the signal *ready* given, cover taken, and the firing plug inserted as prescribed in par. 375.

Notes on the Drill of the Gun Detachment.

377. Where much traversing between the firing and loading positions is necessary, or the cartridge is carried a considerable distance, an additional man, No. 11, will be added to the gun detachment.

No. 11 takes post near the door of the cartridge room and brings the cartridge, as prescribed for No. 7, and the latter remains at the traversing crank. Should either of the two become fatigued during continued firing they will be required to exchange posts.

AMMUNITION DETACHMENT FOR AN EMPLACEMENT.

378. Chief of detachment (sergeant), 2 corporals, and 16 privates assigned and numbered as follows:

Projectile detail, 1 corporal and Nos. 1 to 12.

Cartridge detail, 1 corporal and Nos. 13 to 16.

Duties.

Each member of the detachment on reaching his post examines the material to which he is assigned and reports all defects he finds to the chief of detachment.

The chief of detachment exercises general supervision over the supply of ammunition and is responsible that the designated kind is delivered promptly and that all magazine regulations for safety are enforced.

Nos. 1 and *2* operate a trolley and differential pulley. No. 2 places the shell tongs over the gravity band on a projectile of the kind ordered, locks them, and then steadies them while No. 1 hoists until there is sufficient weight on the tongs to prevent their slipping and then assists No. 1 in hoisting. They stop hoisting when the projectile reaches the proper height, run the trolley to the truck, No. 1 pulling on the chains and No. 2 pushing on the tongs. No. 1 lowers the projectile onto the truck, point to the front, and No. 2 removes the tongs. They then return the trolley for another projectile. In hoisting and lowering projectiles the men should keep the chain on which they pull in the plane of the sheave over which it passes.

Nos. 3 and ***4, 5*** and ***6, 7*** and ***8*** operate other trolleys and pulleys, the odd-numbered men performing the duties prescribed for No. 1, and the even-numbered men those for No. 2.

Nos. 9, 10, 11, and ***12*** run empty trucks into the shell room and under the trolley tracks to receive projectiles and when loaded place them near the entrance and clear of incoming trucks.

Where the entrance to the shell room is too narrow for the admission of trucks the trolleys will be run out of the shell room and the projectiles delivered to the trucks near the entrance. In this case Nos. 9, 10, 11, and 12 are not required.

Nos. 13, 14, 15, and ***16*** take cartridges of the number ordered and pass them to the Nos. 7 of the gun detachments.

Where there are two magazines for one emplacement there will be a separate detachment for each consisting of 3 noncommissioned officers and 8 privates numbered from 1 to 8, one corporal and Nos. 1 to 6 constituting the projectile detail, the other corporal and Nos. 7 and 8 the cartridge detail.

DRILL FOR 12-INCH MORTAR.

(Carriage, Model 1891.)

379. The same as in pars. 370 to 378, with the following modifications:

Nos. 1 and ***2*** lift the shell tray from the hoist scoop to the truck after the projectile is rammed.

Nos. 5 and ***6*** man the shell-hoist handwheel and raise the shell when directed by No. 2, before taking their places at the rammer.

No. 6 returns to the hoist handwheel after ramming and lowers the scoop when directed by No. 2.

Nos. 9 and ***10*** deliver the shell on the hoist scoop and return the truck to the gallery as soon as the scoop has been replaced on it.

DRILL FOR 6-INCH GUN.

(Mounted on disappearing carriage.)

GUN DETACHMENT.

380. Chief of detachment (noncommissioned officer), gun-pointer (duly qualified noncommissioned officer or private), and 10 privates.

Posts.

381. *Chief of detachment,* 2 yards in rear of breech, facing it.

Gun-pointer, sighting platform.

No. 1, 2 feet to the right and rear of the breech, facing it.

No. 2, 2 feet to the left and rear of the breech, facing it.

No. 3, 2 yards in rear of the breech, facing it.

No. 4, at the elevating handwheel, facing it.

Nos. 5 and *6,* at the serving table at the rear side of the loading platform, facing to the front, No. 5 on the right side, No. 6 on the left.

No. 7, on the gun platform at the head of the steps leading to the cartridge room.

No. 8, at the telautograph.

Nos. 9 and *10,* on the banquette, facing the gun, No. 9 on the right.

The posts of the gun detachment as given above are for inspection and preparatory to the service of the gun.

The men resume their posts on completion of any duty requiring them elsewhere.

The chief of detachment and gun-pointer go wherever their presence is necessary.

Duties.

382. *The gun commander* repeats the commands *commence firing* and *cease firing,* announces the kind of projectile to be used, the order of fire, the method of pointing, and, in restricted fire, the number of shots and the firing interval, all in accordance with the orders of the battery commander.

For general duties, see pars. 67, 68, 69, 234, 244, 245, 253, 254, and 293.

The chief of detachment is responsible that the general instructions given in paragraphs 209 to 226, inclusive, are carried out.

For general duties, see par. 244.

The gun-pointer.—For general duties, see pars. 230 to 235, inclusive.

Equipments and Implements.

383. *The gun-pointer* procures the sight and difference chart, places the sight on its seat on the sight standard and the chart in a convenient place for use in Case III.

No. 1 procures a silk wiper or cotton waste, the lanyard, and a can containing a hand sponge and lubricating oil for the threads of the breechblock and breech recess; he places the lanyard and can convenient to the breech and carries the wiper or cotton waste in his belt.

He equips himself with the primer pouch and places the holder containing punch, gimlet, and reamer convenient to the piece.

No. 2 procures the loading tray and places it convenient to the breech. He carries a silk wiper or cotton waste in his belt.

No. 3 procures the rammer and prop and places them to the right of his post, rammer head to the front.

No. 5 procures a wrench for filling plugs, a funnel, and a measure containing oil for filling the recoil cylinders, and places them near the parapet to the right of the carriage.

No. 6 procures a wrench for filling plugs and places it convenient to the left cylinder.

No. 7 procures the chamber sponge and extractor for the dummy charge, places the sponge on the prop and the extractor to one side on the platform.

Opening and Closing the Breech.

384. *To open the breech:* Rotate the lever handle in one continuous motion to the rear and right as far as it will go.

To close the breech: Rotate the lever handle in one continuous motion to the left until the lever is parallel to the face of the breech.

To Examine Gun.

385. Each member of the detachment reports all defects he finds to the chief of detachment.

The chief of detachment inspects the gun and carriage to see if all parts are in good order and the bearings well lubricated and examines the gas check and the throttling valve to see if they are properly adjusted. He inspects the firing attachments and tests the electric firing circuit. On completion of the examination he directs the breech to be closed and reports the condition of the piece to the gun commander.

The gun-pointer inspects the sight, tests the sight standard and azimuth subscale for adjustment, and inspects and tests the traversing and elevating gears and firing key.

No. 1 removes the breech cover and places it out of the way, opens the breech, examines the breechblock and breech mechanism, cleans them if necessary, oils all the bearing parts and the threads of the breechblock, clears the vent, removing all water, oil, and other obstructions, and wipes the primer seat clean. He frees the lanyard of kinks, hooks it to the ring of the safety lanyard, coils it, beginning at the loop end, and hangs it on the end of the elevating arm. He closes the breech when directed.

No. 2 examines the bore, chamber, gas-check seat, and breech recess, cleans them if necessary, and oils the threads of the breech recess. If the bore or chamber needs cleaning, he calls for the sponge and assists in sponging.

No. 3 brings the sponges when they are called for, assists No. 2 in sponging the chamber and bore, and replaces the sponges.

No. 4 removes the muzzle cover and places it out of the way and operates the elevating and traversing gears when so directed by the gunner.

Nos. 5 and ***6*** mount on the chassis, each carrying a plug wrench. They remove the filling plugs from both recoil cylinders and ascertain if they contain the proper amount of oil. It is necessary that both cylinders be open when filling is done to avoid the formation of an air cushion. If oil is required, No. 5 calls on No. 7 for the funnel and oil measure, pours oil into the filling hole of one cylinder until the oil reaches the proper level in both cylinders, and passes the funnel and measure back to No. 7, who replaces them. Nos. 5 and 6 replace the filling plugs, screw them well home, replace the wrenches, and then take their posts.

No. 7 passes up and replaces the funnel and oil measure when they are used.

No. 8 examines and tests the telautograph. If a telephone is provided, he puts on the head receiver and wears it until dismissed.

To Load and Fire.

386. *The chief of detachment* commands: 1. ***No. —***, 2. ***With shot*** (***shell, shrapnel, or dummy projectile***), 3. ***LOAD.***

He commands *in battery* in time to add *TRIP* as soon as the breech is closed. When it is not desired to trip the gun the command *halt* is given instead of *trip*.

The piece being fully in battery and set for elevation, Case II, and for elevation and azimuth, Case III, he commands and signals *READY* as soon as the safety switch is closed.

The gun-pointer traverses the gun and performs the duties prescribed in par. 230, 231, or 232, according to the method of pointing ordered.

He fires the piece electrically by closing the firing key and commands *fire* at the same time.

He both calls out and signals *azimuth set*, Case III, as the piece goes in battery, signaling by holding one hand at the height of the head until the signal *ready* is made by the chief of detachment.

No. 1 opens the breech if it is not already open, inserts a primer in the vent, lowers the slide, and takes the lanyard. *The slide must be lowered entirely down;* otherwise the primer may be blown to the rear and endanger the lives of the men. He closes the breech as soon as the loading tray is removed and hooks the safety lanyard to the eye of the firing leaf. At the command *trip* he steps back to a position in rear and slightly to the right of the piece. He pulls the lanyard with a strong quick pull—not a jerk—at the signal *fire*. If there is difficulty in opening or closing the breech, he examines the threads of the breechblock, wipes off any dirt found, and oils the mechanism.

Immediately after the piece is fired he coils the lanyard as he walks toward the piece, opens the breech, and removes the fired primer.

No. 2 inserts the loading tray and the cartridge, pushing the latter into the chamber by hand until its base barely clears the gas-check seat, a position from which it will be pushed into place by the mushroom head as the breech is closed, remain in contact with it and facilitate ignition; he then removes the loading tray and retains it in his hand. If there is difficulty in opening or closing the breech, he examines the threads of the breech recess, wipes off any dirt found, and oils the threads if they become dry.

No. 3 seizes the rammer staff, rams the projectile home in one motion with all force, withdraws the rammer, replaces it on the prop, and goes to the right tripping lever; at the command *in battery* he seizes the tripping lever and at the command *trip* raises it to its full height and then releases it.

Immediately after the piece is fired he unhooks the safety lanyard, and as soon as the breech is opened sponges the chamber.

No. 4 keeps the piece continually set at the proper elevation, except in Case I. As the piece comes fully in battery (or as soon thereafter as practicable) he both calls out and signals *elevation set*, signaling by holding one hand at the height of his head until the signal *ready* is made by the chief of detachment.

Nos. 5 and ***6*** alternate in bringing a projectile from the serving table and launching it on the loading tray, passing between No. 2 and the breech in returning to their post.

No. 7 receives a cartridge from No. 5 or No. 6 of the ammunition detachment, passes it to No. 2, and goes to the safety switch; he closes the switch as soon as the gun is in battery.

No. 8 calls out and posts ranges and deflections or azimuths received.

Nos. 9 and ***10*** take projectiles of the designated kind from a truck and place them on the serving table.

To Unload a Dummy Charge.

387. The chief of detachment commands: ***UNLOAD.***

No. 1 opens the breech.

No. 2 inserts the loading tray, withdraws the cartridge and passes it to No. 7, and, as soon as the projectile is withdrawn, removes the loading tray.

No. 3 brings up the extractor, pulls the projectile onto the loading tray, and replaces the extractor.

No. 5 withdraws the projectile and returns it to the serving table.

No. 7 carries the cartridge to the steps and passes it to No. 5 or No. 6 of the ammunition detachment.

To Retract the Gun.

388. To bring the gun from the firing to the loading position the chief of detachment commands: 1. *From battery,* 2. ***HEAVE,*** 3. ***HALT.***

At the first command No. 3 goes to the retraction crank and operates the pawl and speed crank to permit the pulling out of the ropes. Nos. 5 and 6 mount on the carriage and place the loops of the ropes on the hooks. Nos. 1 and 2 pull out the ropes and pass the ends to Nos. 5 and 6. No. 3 takes in the slack.

Nos. 3 and 4 take positions at the retraction crank and at the second command turn the crank. Nos. 5 and 6 relieve Nos. 3 and 4 when directed by the chief of detachment. When the gun has reached the loading position the command *halt* is given. At the command *cast off* No. 3 lets out enough slack to enable Nos. 1 and 2 to take the loops off the hooks.

To prevent injury to the ropes by reverse winding in letting out slack, the chief of detachment takes a position where he can see one of the drums and stops the unwinding before the last turn of the rope is off the drum.

To prevent injury to the ropes by winding across the grooves, No. 1 watches the right drum and No. 2 the left until the ropes are taut, and if either rope fails to wind in the proper groove the man on that side calls *halt,* when the winding is stopped and the rope guided into the proper groove. Taking in the slack is then resumed.

Notes on the Drill of the Gun Detachment.

389. In an emplacement provided with an ammunition hoist Nos. 5 and 6 are posted at and serve projectiles from a loaded truck placed to the rear of the gun and toward the hoist; Nos. 9 and 10 are posted at the delivery table, load trucks with projectiles, run loaded trucks to the post of Nos. 5 and 6, and return empty ones to the delivery table.

In Case III, the gun-pointer will close the safety switch instead of No. 7 whenever the switch is located within reach from the gun-pointer's post at the azimuth index.

The members of the detachment remain at their posts when the gun is fired and should have cotton in their ears.

They must be trained to work together with the utmost celerity and precision and without interfering with one another.

When they become proficient the interval between the commands *load* and *trip* should not as a rule exceed ten seconds.

AMMUNITION DETACHMENT.

390. Chief of detachment (noncommissioned officer) and 6 privates posted and numbered as follows:

Shell room, Nos. 1, 2, and 3.
Cartridge room, Nos. 4, 5, and 6.

Duties.

391. Each member of the detachment on reaching his post examines the material to which he is assigned and reports all defects he finds to the chief of detachment.

The chief of detachment exercises general supervision over the supply of ammunition and is responsible that the designated kind is delivered promptly, and that all magazine regulations for safety are enforced.

Nos. 1 and *2* load one truck with shell, one with shot, one with shrapnel, and a fourth one with the kind of projectile first designated for use.

They load empty trucks returned by No. 3 with the kind of projectile last ordered.

No. 3 runs a truck loaded with projectiles of the designated kind to a position in rear of the gun and close to the banquette. He runs out other loaded trucks and returns empty ones to the shell room as may be necessary to keep up the supply of projectiles.

In an emplacement provided with an ammunition hoist No. 1 works the hoist and Nos. 2 and 3 carry projectiles by hand and place them on the receiving table.

No. 4 uncases cartridges and Nos. 5 and 6 carry them to the front steps of the loading platform and pass them to No. 7 of the gun detachment.

DRILL FOR THE 6-INCH GUN.

(On pedestal mount.)

GUN DETACHMENT.

392. Chief of detachment (noncommissioned officer), gun-pointer (duly qualified noncommissioned officer or private), and 10 privates.

Posts.

393. *Chief of detachment,* 2 yards in rear of the breech, facing it.

Gun-pointer, left sighting platform, facing to the front.

No. 1, 2 feet to the right and rear of the breech, facing it.

No. 2, 2 feet to the left and rear of the breech, facing it.

No. 3, on the right sighting platform, facing to the front.

No. 4, 2 yards to the right and rear of the breech, facing to the front.

Nos. 5 and *6,* at the serving table at the rear side of the gun platform (or at the delivery table where there is a hoist), facing the gun, No. 5 on the right.

No. 7, near the recess for cartridges (or at the head of the steps leading to the cartridge room if there is no recess), facing the gun.

No. 8, at the telautograph.

Nos. 9 and *10,* on the banquette, facing the gun, No. 9 on the right.

The posts of the gun detachment as given above are for inspection and preparatory to the service of the gun.

The men resume their posts on completion of any duty requiring them elsewhere.

The chief of detachment and gun-pointer go wherever their presence is necessary.

Duties.

394. *The gun commander* indicates the target, repeats the commands *commence firing* and *cease firing,* announces the kind of projectile to be used, the order of fire, and, in restricted fire, the number of shots and the firing interval, all in accordance with the orders of the battery commander.

For general duties see pars. 67, 68, 69, 234, 244, 245, 253, 254, and 293.

The chief of detachment is responsible that the gun-pointer identifies the target, and that the general instructions given in pars. 209 to 226, inclusive, are carried out. For general duties see par. 244.

The gun-pointer.—For general duties see pars. 230 to 235, inclusive.

Equipments and Implements.

395. *The gun-pointer* procures the left sight and places it in position.

No. 1 procures a silk wiper or cotton waste and a can of lubricating oil for the breech mechanism, places the can convenient to the breech, and carries the wiper or cotton waste in his belt.

He equips himself with the primer pouch and places the holder containing punch, gimlet, and reamer convenient to the piece.

No. 2 procures the lanyard and loading tray and places them convenient to the breech. He carries a silk wiper or cotton waste in his belt.

No. 3 procures the right sight and places it in position.

No. 4 procures the rammer and prop and places them to the right of his post, rammer head to the front.

No. 5 procures a wrench for filling plugs, a funnel, and a measure containing oil for filling the recoil cylinders, and places them near the parapet, to the right of the carriage.

No. 6 procures the chamber sponge and extractor, places the sponge on the prop and the extractor at one side of the loading platform.

Opening and Closing the Breech.

396. *To open the breech:* Rotate the lever handle in one continuous motion to the rear and right as far as it will go.

To close the breech: Rotate the lever handle in one continuous motion to the left until the lever is parallel to the face of the breech.

To Examine Gun.

397. Each member of the detachment reports all defects he finds to the chief of detachment.

The chief of detachment inspects the gun and carriage to see if all parts are in good order and the bearings well lubricated, and examines the gas check to see if it is properly adjusted. He inspects the firing attachments and tests the electric firing circuit. On completion of the examination he directs the breech to be closed and reports the condition of the piece to the gun commander.

The gun-pointer inspects the sights, tests the sight standard and inspects and tests the traversing and elevating gears and firing key.

No. 1 removes the breech cover and places it out of the way, opens the breech, examines the breechblock and breech mechanism, cleans them if necessary, oils all the bearing parts and the threads of the breechblock, clears the vent, removing all water, oil, and other obstructions, wipes the primer seat clean, and closes the breech when directed.

No. 2 examines the bore, chamber, gas-check seat, and breech recess, cleans them if necessary, and oils the threads of the breech recess.

If the bore or chamber needs cleaning, he calls for the sponge and assists in sponging.

If the firing circuit is out of order, he hooks the lanyard to the eye of the firing leaf.

No. 3 assists the gun-pointer.

No. 4 brings the sponges when they are called for, assists No. 2 in sponging the chamber and bore, and replaces the sponges.

No. 5 removes the filling plugs on the right side of the carriage, pours in oil until it stands in the filling hole, allows the escape of air, refills, and then replaces the filling plugs and the oil measure and funnel.

No. 6 removes the muzzle cover and places it out of the way.

No. 8 examines and tests the telautograph.

If a telephone is provided, he puts on the head receiver and wears it until dismissed.

To Load and Fire.

398. *The chief of detachment* indicates the target and range and commands: 1. *No.* —, 2. *With* (such a projectile), 3 *COMMENCE FIRING* (or, so many rounds, *COMMENCE FIRING*).

After the first round the projectile is named only when a different kind is ordered and the gun is loaded without command immediately after it is fired.

The gun-pointer, assisted by No. 3, performs the duties prescribed in par. 230.

He fires the piece electrically or commands *fire* if the firing circuit is out of order. In simulated firing he calls out *fire* as a signal for loading when he closes the firing key.

No. 1 opens the breech if it is not already open, inserts a primer in the vent, and lowers the slide. *The slide must be lowered entirely down;* otherwise the primer may be blown to the rear and endanger the lives of the men. He closes the breech as soon as the loading tray is withdrawn and calls out *ready* when clear of the recoil.

If there is difficulty in opening or closing the breech, he examines the breechblock, wipes off any dirt found, and oils the threads and breech mechanism.

Immediately after the piece is fired he opens the breech and removes the fired primer.

No. 2 inserts the loading tray and cartridge, pushing the cartridge into the chamber by hand until its base barely clears the gas-check seat, a position from which it will be pushed into place by the mushroom head as the breech is closed, remain in contact with it and facilitate ignition, removes the loading tray and places it on the platform, takes the lanyard if it is to be used and pulls it at the command *fire* with a strong, quick pull—not a jerk.

If there is difficulty in opening or closing the breech, he examines the threads of the breech recess, wipes off any dirt found, and oils the threads if they become dry.

Immediately after the gun is fired he sponges the chamber and replaces the sponge.

No. 3, under the gun-pointer's direction, sets the deflection scale of his sight and gives *direction* in Case I as prescribed in par. 230.

No. 4 seizes the rammer staff, rams the projectile home in one motion with all force, and withdraws the rammer.

Nos. 5 and ***6*** alternate in bringing a projectile from the serving table and launching it on the loading tray.

No. 7 receives a cartridge from No. 4 or 5 of the ammunition detachment (or takes one from the recess) and passes it to No. 2.

No. 8 calls out and posts ranges and deflections received.

Nos. 9 and ***10*** take projectiles of the designated kind from a truck and place them on the serving table.

To Unload a Dummy Charge.

399. The chief of detachment commands: ***UNLOAD.***

No. 1 opens the breech.

No. 2 withdraws the cartridge and passes it to No. 7.

No. 4 brings up the extractor; pulls the projectile onto the loading tray, and replaces the extractor.

No. 5 withdraws the projectile and returns it to the serving table.

No. 7 passes the cartridge to No. 5 or No. 6 of the ammunition detachment (or returns it to the recess).

Notes on the Drill of the Gun Detachment.

400. In an emplacement provided with an ammunition hoist No. 10 is not required and No. 9 is posted at the hoist and notifies the chief of the ammunition detachment what kind of projectile is ordered and when to start and stop the hoist.

The members of the detachment remain at their posts when the gun is fired and should have cotton in their ears.

They must be trained to work together with the utmost celerity and precision and without interfering with one another.

AMMUNITION DETACHMENT.

401. Chief of detachment (noncommissioned officer) and 6 privates posted and numbered as follows:

Shell room, Nos. 1, 2, and 3.
Cartridge room, Nos. 4, 5, and 6.

Duties.

402. Each member of the detachment on reaching his post examines the material to which he is assigned and reports all defects he finds to the chief of detachment.

The chief of detachment exercises general supervision over the supply of ammunition and is responsible that the designated kind is delivered promptly and that all magazine regulations for safety are enforced.

Nos. 1 and *2* load one truck with shell, one with shot, one with shrapnel, and a fourth one with the kind of projectile first designated for use.

They load empty trucks returned by No. 3 with the kind of projectile last ordered.

No. 3 runs a truck loaded with projectiles of the designated kind to a position in rear of the gun and close to the banquette. He runs out other loaded trucks and returns empty ones to the shell room as may be necessary to keep up the supply of projectiles.

In an emplacement provided with an ammunition hoist No. 1 works the hoist and Nos. 2 and 3 carry projectiles by hand and place them on the receiving table.

No. 4 uncases cartridges, and Nos. 5 and 6 carry them up the steps and pass them to No. 7 of the gun detachment (or place them in the recess).

DRILL FOR THE 6-INCH ARMSTRONG GUN.

(On pedestal mount.)

GUN DETACHMENT.

403. Chief of detachment (noncommissioned officer), gun-pointer (duly qualified noncommissioned officer or private), and 8 privates.

Posts.

404. *Chief of detachment,* at the foot of the steps to the loading platform, in rear of and facing the breech.

Gun-pointer, immediately in rear of the shoulder piece, facing to the front.

No. 1, 2 feet to the right and rear of the breech, facing it.

No. 2, 2 feet to the left and rear of the breech, facing it.

No. 3, 4 feet to the rear and a little to the left of the breech, facing it.

No. 4, near the cartridge table, to the left and rear of the gun platform, facing the breech.

Nos. 5 and *6,* near the projectile table, to the right and rear of the gun platform, facing the breech, No. 5 on the right.

No. 7, at the foot of the steps to the left of the breech, facing it.

No. 8, at the telautograph.

The posts of the gun detachment as given above are for inspection and preparatory to the service of the gun.

The men resume their posts on completion of any duty requiring them elsewhere.

The chief of detachment and gun-pointer go wherever their presence is necessary.

Duties.

405. *The gun commander* indicates the target, repeats the commands *commence firing* and *cease firing,* announces the kind of projectile to be used, the order of fire, and, in restricted fire, the number of shots and the firing interval, all in accordance with the orders of the battery commander.

For general duties see pars. 67, 68, 69, 234, 244, 245, 253, 254, and 293.

The chief of detachment is responsible that the gun-pointer identifies the target and that the general instructions given in pars. 209 to 226, inclusive, are carried out. For general duties see par. 244.

The gun-pointer is responsible for the proper regulation of the current for the lights of the night sights. For general duties see pars. 230 to 235, inclusive.

Equipments and Implements.

406. *The gun-pointer* procures the sight and places it in position.

No. 1 procures a silk wiper or cotton waste, the lanyard, and a can of lubricating oil for the breech mechanism; he places the can and lanyard convenient to the breech and carries the wiper or cotton waste in his belt.

No. 2 equips himself with a pair of gloves and the hand extractor and procures a silk wiper or cotton waste, which he carries in his belt.

No. 3 procures the rammer.

No. 4 equips himself with a pouch containing percussion primers.

Nos. 5 and *6* procure the tool box and place it in a convenient position under cover.

No. 7 equips himself with a pair of gloves and places the sponge and prop conveniently to the left of the gun platform.

Opening and Closing the Breech.

407. *To open the breech:* Rotate the lever handle in one continuous motion to the rear and right as far as it will go.

To close the breech: Rotate the lever handle in one continuous motion to the left until the lever is parallel to the face of the breech.

To Examine Gun.

408. Each member of the detachment reports all defects he finds to the chief of detachment.

The chief of detachment inspects the gun, carriage, and firing attachments to see if all parts are in good order. On completion of the examination he directs the breech to be closed and reports the condition of the piece to the gun commander.

He orders the use of the alternative firing cable or percussion firing when necessary, and in the latter case notifies the chief of the ammunition detachment.

The gun-pointer inspects the sight and tests the traversing and elevating gears, the electric firing circuit, and, at night, the circuit for the night sights.

No. 1 removes the breech cover and places it out of the way, opens the breech, examines the breechblock and breech mechanism, cleans them if necessary, oils all the bearing parts and the threads of the breechblock, adjusts the resistance of the light circuit for the night sights under direction of the gun-pointer, and closes the breech when directed.

No. 2 examines the bore, chamber, and breech recess, cleans them if necessary, and oils the threads of the breech recess.

If the bore or chamber needs cleaning, he calls for the sponge and assists in sponging.

No. 3 brings the sponge when it is called for, assists No. 2 in sponging the chamber and bore, and replaces the sponge.

No. 4 removes the filling and air plugs on the right side of the carriage. If the reserve oil tank is not full, he procures a funnel and measure of oil, pours in oil until it overflows through the air hole, replaces the air plug and fills in until the oil stands in the filling hole, replaces the filling plug, and returns the oil measure and funnel.

No. 5 removes the muzzle cover and places it out of the way.

No. 8 examines and tests the telautograph.

If a telephone is provided, he puts on the head receiver and wears it until dismissed.

To Load and Fire.

409. *The chief of detachment* indicates the target and range, and commands: 1. *No.* —, 2. *With* (such projectile), 3. ***COMMENCE FIRING*** (or so many rounds, ***COMMENCE FIRING***).

He repeats the command *cease firing.*

After the first round the projectile is named only when a different kind is ordered, and the gun is loaded without command immediately after it is fired.

The gun-pointer performs the duties prescribed in par. 216.

He fires the piece electrically, or commands *No.* —, 2. ***FIRE,*** if the firing circuit is out of order. In simulated firing he calls out *fire* when he closes the firing key, as a signal to load.

No. 1 opens the breech if it is not already open, closes it as soon as the cartridge is inserted, calls out *ready* as soon as he is clear of the recoil, and then watches the gun to see if there is a missfire. (See pars. 219 and 221.)

If there is difficulty in opening or closing the breech, he examines the threads of the breechblock, wipes off any dirt found, and oils the mechanism.

When the use of the *alternative firing cable* is ordered, he connects it to the battery and firing pin, holds the firing key in his right hand, and closes the key at the command *fire.*

When *percussion firing* is ordered, he turns the percussion firing trigger to a horizontal position on the right and attaches the lanyard. He pulls the lanyard at the command *fire.*

No. 2 receives a cartridge from No. 4 and inserts it, taking care in percussion firing to hold the primer in its seat.

For percussion firing he cocks the firing pin as soon as the breech is closed.

He extracts the empty case after the gun is fired and passes it to No. 7.

No. 3 rams the projectile home with force.

No. 4 passes a cartridge to No. 2. For percussion firing he inserts a primer in the adaptor before passing the cartridge.

Nos. 5 and *6* alternate in bringing a projectile to the right and rear of the breech and inserting it in the chamber, taking care that the point does not strike.

No. 7 places the empty cartridge cases out of the way.

No. 8 calls out and posts ranges and deflections received.

To Unload a Dummy Charge.

410. The chief of detachment commands: *UNLOAD.*

No. 1 opens the breech. No. 2 extracts the cartridge and passes it to No. 7, who replaces it on the cartridge table. No. 5 withdraws the projectile and replaces it on the serving table. No. 1 then closes the breech.

Lights for Night Sights.

411. The lights will not be put into action until required. To put the lights into action, first set the resistance pointers at *off* to avoid running the battery down, and then push in the terminal plug for making the circuit and move the resistance pointers around in the direction of the arrow sufficiently to give the smallest quantity of light compatible with distinguishing the sights, so that the eye will not be dazzled.

The circuit should be broken by removing the terminal plug immediately after the firing has ceased, to avoid unnecessarily running the battery down.

AMMUNITION DETACHMENT.

412. Chief of detachment (noncommissioned officer) and 6 privates posted and numbered as follows:

Shell room, Nos. 1, 2, and 3.

Cartridge room, Nos. 4, 5, and 6.

Duties.

Each member of the detachment on reaching his post examines the material to which he is assigned and reports all defects he finds to the chief of detachment.

The chief of detachment exercises general supervision over the supply of ammunition and is responsible that the designated kind is delivered promptly and that all magazine regulations for safety are enforced.

Nos. 1, 2, and *3* carry projectiles of the kind last designated and place them on the table to the right and rear of the gun platform.

Nos. 4, 5, and *6* carry cartridges and place them on the table to the left and rear of the gun platform or under cover near the parapet.

During hostilities at least ten rounds should be kept near the gun platform, ready for immediate use.

Notes on the drill.

413. If a cartridge jams and will not go home with the force due to swinging the breechblock smartly, never attempt to drive it home by forcing the block; withdraw the cartridge and try another.

If a cartridge case extracts with difficulty, feel for a burr round the edge of the chamber, and, if one is found, file it smooth.

The members of the detachment remain at their posts when the gun is fired and should have cotton in their ears.

DRILL FOR THE 5-INCH GUN.

(Mounted on barbette carriage, balanced pillar.)

GUN DETACHMENT.

414. Chief of detachment (noncommissioned officer), gun-pointer (duly qualified noncommissioned officer or private), and 6 privates.

Posts.

415. *Chief of detachment,* 2 yards in rear of the loading platform, facing to the front.

Gun-pointer, on the loading platform, to the left of the breech, facing to the front.

Nos. 1, 2, and *3,* on the loading platform; No. 1 to the right of the breech, facing it; No. 2 to the left and rear of the breech, facing it; No. 3 to the right and rear of the breech, facing it.

No. 4, near the recess for cartridges or at the head of the steps leading to the cartridge room if there is no recess.

Nos. 5 and *6,* at the serving table at the rear side of the platform, facing the gun, No. 5 on the right side, No. 6 on the left.

The posts of the gun detachment as given above are for inspection and preparatory to the service of the gun.

The men resume their posts on completion of any duty requiring them elsewhere.

The chief of detachment and gun-pointer go wherever their presence is necessary.

Duties.

416. *The gun commander* indicates the target, repeats the commands *commence firing* and *cease firing,* announces the kind of projectile to be used, the order of fire, and, in restricted fire, the number of shots and the firing interval, all in accordance with the orders of the battery commander.

For general duties see pars. 67, 68, 69, 234, 244, 245, 253, 254, and 293.

The chief of detachment is responsible that the gun-pointer identifies the target and that the general instructions given in pars. 209 to 226, inclusive, are carried out. For general duties see par. 244.

The gun-pointer is responsible for the proper regulation of the current for the lights of the night sights. For general duties see pars. 230 to 235, inclusive.

Equipments and Implements.

417. *The gun-pointer* procures the sight and places it in position.

No. 1 procures a silk wiper or cotton waste and a can containing a hand sponge and lubricating oil for the threads of the breechblock and breech recess; he places the can convenient to the breech and carries the wiper or cotton waste in his belt.

He equips himself with the primer pouch and attaches the holder containing punch, gimlet, and reamer to the railing of the loading platform.

No. 2 procures the loading tray and lanyard and places them convenient to the breech. He carries a silk wiper or cotton waste in his belt.

No. 3 procures the sponge and rammer and places it on the right side of the loading platform.

No. 4 procures a wrench for the filling plug, a funnel, and a measure containing oil for filling the recoil cylinder, and places them near the parapet to the right of the gun.

No. 5 procures a ratchet lever and places it on the right end of the pinion shaft.

No. 6 procures a ratchet lever and at drill the extractor for the dummy charge, places the lever on the left end of the pinion shaft and the extractor at one side of the gun platform.

Opening and Closing the Breech.

418. *To open the breech:* Move the lever handle in one continuous motion to the rear and right as far as it will go.

To close the breech: Move the lever handle in one continuous motion to the left until the lever is parallel to the face of the breech.

To Examine Gun.

419. Each member of the detachment reports all defects he finds to the chief of detachment.

The chief of detachment inspects the gun, carriage, and firing attachments to see if all parts are in good order, and examines the gas check to see if it is properly adjusted. On completion of the examination he directs the breech to be closed and reports the condition of the piece to the gun commander.

The gun-pointer inspects the sight and tests the traversing and elevating gears, the electric firing circuit, and, at night, the circuit for the night sights.

He depresses the gun to its full extent for filling the recoil cylinder.

No. 1 removes the breech cover and places it out of the way, opens the breech, examines the breechblock and breech mechanism, cleans them if necessary, oils all the bearing parts and threads of the breechblock, clears the vent, removing all water, oil, and other obstructions, and wipes the primer seat clean. He adjusts the resistance of the light circuit for the night sights under direction of the gun-pointer and closes the breech when directed.

No. 2 examines the bore, chamber, gas-check seat, and breech recess, cleans them if necessary, and oils the threads of the breech recess.

If the bore or chamber needs cleaning, he calls for the sponge and assists in sponging.

When the firing circuit is out of order he hooks the lanyard to the eye of the firing leaf and it remains hooked during the firing.

No. 3 brings the sponges when they are called for, assists No. 2 in sponging the chamber and bore, and replaces the sponges.

No. 4 removes the filling plug from the recoil cylinder as soon as the gun is depressed and if the cylinder is not full he pours in oil until it appears in the filling hole after the funnel is removed. He replaces the filling plug, screwing it well home, and replaces the wrench, funnel, and measure.

No. 5 removes the muzzle cover and places it out of the way.

To Load and Fire.

420. ***The chief of detachment*** indicates the target and range and commands: 1. ***No.*** —, 2. ***With*** (such projectile), 3. ***COMMENCE FIRING*** (or, so many rounds, ***COMMENCE FIRING***).

After the first round the projectile is named only when a different kind is ordered, and the gun is loaded without command immediately after it is fired.

The gun-pointer performs the duties prescribed in par. 216.

He fires the piece electrically or commands: 1. ***No.*** —, 2. ***FIRE,*** if the firing circuit is out of order. In simulated firing he calls out ***fire*** when he closes the firing key, as a signal to load.

No. 1 opens the breech if it is not already open, inserts a primer in the vent, and lowers the slide. ***The slide must be lowered entirely down;*** otherwise the primer may be blown to the rear and endanger the lives of the men. He closes the breech as soon as the loading tray is withdrawn and calls out ***ready*** as soon as he is clear of the recoil.

If there is difficulty in opening or closing the breech, he examines the threads of the breechblock, wipes off any dirt found, and oils the mechanism.

Immediately after the piece is fired he opens the breech and removes the fired primer.

No. 2 inserts the loading tray, the projectile, and the cartridge, pushing the cartridge into the chamber by hand until its base barely clears the gas-check seat, a position from which it will be pushed into place by the mushroom head as the breech is closed, remain in contact with it, and facilitate ignition. He then removes the loading tray.

If there is difficulty in opening or closing the breech, he examines the threads of the breech recess, wipes off any dirt found, and oils the threads if they become dry.

When the electric firing circuit is out of order he takes the lanyard as soon as the breech is closed and pulls it at the command *fire.* The lanyard should be pulled with a strong quick pull—not a jerk.

No. 3 rams the projectile home with force as soon as it is inserted and steps back to his post, holding the rammer staff vertically, head to the floor.

Immediately after the piece is fired and the breech opened he sponges the chamber, brings the rammer head to the front, and stands ready to ram the next projectile.

• ***No. 4*** receives a cartridge from No. 5 or 6 of the ammunition detachment (or takes one from the recess) and passes it to No. 2 after the projectile is inserted.

Nos. 5 and ***6*** alternate in bringing a projectile from the serving table and passing it to No. 2.

To Unload a Dummy Charge.

421. The chief of the detachment commands: ***UNLOAD.***

No. 1 opens the breech.

No. 2 inserts the loading tray, withdraws the cartridge and passes it to No. 4, takes the projectile from the loading tray and passes it to No. 5, and then removes the loading tray.

No. 3 pulls the projectile onto the loading tray with the extractor and passes the extractor to No. 6.

No. 4 passes the cartridge to No. 5 of the ammunition detachment (or returns it to the recess).

No. 5 returns the projectile to the serving table.

No. 6 brings up and replaces the extractor.

Lights for Night Sights.

422. The lights will not be put into action until required. To put the lights into action, first set the resistance pointers at *off* to avoid running the battery down and then push in the terminal plug for making the circuit and move the resistance pointers around in the direction of the arrow sufficiently to give the smallest quantity of light compatible with distinguishing the sights, so that the eye will not be dazzled.

The circuit should be broken by removing the terminal plug immediately after the firing has ceased, to avoid unnecessarily running the battery down.

To Raise and Lower the Gun.

423. *To raise the gun to the firing position:* The chief of detachment commands: 1. *Raise gun,* 2. *Unclamp,* 3. ***HEAVE.***

At the first command the men step clear of the loading platform and Nos. 5 and 6 man the ratchet levers, No. 5 on the right side and No. 6 on the left. At the second command No. 3 removes the pillar locking pins and No. 6 unclamps by pulling the clamp lever to a horizontal position. At the third command the two men, working together, raise the gun to its full height and No. 5 clamps it in that position by raising the clamp lever to a vertical position.

Each man then removes his lever and replaces it on the pinion shaft in proper position for racking down.

No. 4 hooks the ladder to the loading platform. All the numbers resume their posts.

To lower the gun from the firing position: The chief of detachment commands: 1. *Lower gun,* 2. *Unclamp,* 3. ***HEAVE.***

At the first command the men step clear of the loading platform, No. 4 removes the ladder and Nos. 5 and 6 man the ratchet levers. At the second command No. 6 unclamps and at the third command Nos. 5 and 6 lower the gun. No. 3 replaces the pillar locking pins, No. 5 clamps the pinion shaft, and all the numbers resume their posts.

To Raise or Lower the Shield.

424. The chief of detachment commands: 1. *Raise (or Lower) Shield,* 2. ***HEAVE.*** At the first command Nos. 1 and 2 go to the shield, each on his own side, mounting on the carriage if the gun is in the raised position. No. 1 grasps the lever with the left hand and removes the locking pin with the right. At the second command No. 1 throws his weight on the lever and No. 2 throws his weight on the upper edge of the shield and the shield is raised or lowered, No. 1 inserting the locking pin when the shield is in position.

AMMUNITION DETACHMENT.

425. Chief of detachment (noncommissioned officer) and 6 privates posted and numbered as follows:

Shell room, Nos. 1, 2, and 3.
Cartridge room, Nos. 4, 5, and 6.

Duties.

Each member of the detachment on reaching his post examines the material to which he is assigned and reports all defects he finds to the chief of detachment.

The chief of detachment exercises general supervision over the supply of ammunition, and is responsible that the designated kind is delivered promptly and that all magazine regulations for safety are enforced.

Nos. 1, 2, and *3* carry projectiles of the kind last designated and place them on the serving table.

No. 4 uncases cartridges and Nos. 5 and 6 carry them to the gun platform and pass them to No. 4 of the gun detachment (or place them in the recess).

During hostilities at least ten rounds should be kept on the gun platform, ready for immediate use.

Notes on the Drill.

426. The members of the detachment remain at their posts when the gun is fired and should have cotton in their ears.

DRILL FOR THE 4.7-INCH GUN.

(On pedestal mount.)

GUN DETACHMENT.

427. Chief of detachment (noncommissioned officer), gun-pointer (duly qualified noncommissioned officer or private), and 7 privates.

Posts.

428. *Chief of detachment,* at the foot of the steps to the loading platform, in rear of and facing the breech.

Gun-pointer, immediately in rear of the shoulder piece, facing to the front.

No. 1, on the right of the gun close to the breech, facing to the rear.

No. 2, 2 feet to the left and rear of the breech, facing it.

No. 3, 4 feet to the rear and a little to the left of the breech, facing to the front.

No. 4, near the cartridge table, to the left and rear of the gun platform, facing the breech.

Nos. 5 and *6,* near the projectile table to the right and rear of the gun platform, facing the breech, No. 5 on the right.

No. 7, at the foot of the steps, to the left of the breech, facing it.

The posts of the gun detachment as given above are for inspection and preparatory to the service of the gun.

The men resume their posts on completion of any duty requiring them elsewhere.

The chief of detachment and gun-pointer go wherever their presence is necessary.

Duties.

429. *The gun commander* indicates the target, repeats the commands *commence firing* and *cease firing,* announces the kind of projectile to be used, the order of fire, and, in restricted fire, the number of shots and the firing interval, all in accordance with the orders of the battery commander.

For general duties see pars. 67, 68, 69, 234, 244, 245, 253, 254, and 293.

The chief of detachment is responsible that the gun-pointer identifies the target and that the general instructions given in pars. 209 to 226, inclusive, are carried out. For general duties see par. 244.

The gun-pointer is responsible for the proper regulation of the current for the lights of the night sights. For general duties see pars. 230 to 235, inclusive.

Equipments and Implements.

430. *The gun-pointer* procures the sight and places it in position.

No. 1 procures a silk wiper or cotton waste, the lanyard, and a can of lubricating oil for the breech mechanism; he places the can and lanyard convenient to the breech and carries the wiper or cotton waste in his belt.

No. 2 equips himself with a pair of gloves and the hand extractor and procures a silk wiper or cotton waste, which he carries in his belt.

No. 3 procures the rammer.

No. 4 equips himself with a pouch containing percussion primers.

Nos. 5 and *6* procure the tool box and place it in a convenient position under cover.

No: 7 equips himself with a pair of gloves and places the sponge and prop conveniently to the left of the gun platform.

Opening and Closing the Breech.

431. *To open the breech:* Rotate the lever handle in one continuous motion to the rear and right as far as it will go.

To close the breech: Rotate the lever handle in one continuous motion to the left until the lever is parallel to the face of breech.

To Examine Gun.

432. Each member of the detachment reports all defects he finds to the chief of detachment.

The chief of detachment inspects the gun, carriage, and firing attachments to see if all parts are in good order. On completion of the examination he directs the breech to be closed and reports the condition of the piece to the gun commander.

He orders the use of the alternative firing cable or percussion firing when necessary and in the latter case notifies the chief of the ammunition detachment.

The gun-pointer inspects the sight and tests the traversing and elevating gears, the electric firing circuit, and, at night, the circuit for the night sights.

No. 1 removes the breech cover and places it out of the way, opens the breech, examines the breechblock and breech mechanism, cleans them if necessary, oils all the bearing parts and the threads of the breechblock, adjusts the resistance of the light circuit for the night sights under direction of the gun-pointer, and closes the breech when directed.

No. 2 examines the bore, chamber, and breech recess, cleans them if necessary, and oils the threads of the breech recess.

If the bore or chamber needs cleaning, he calls for the sponge and assists in sponging.

No. 3 brings the sponge when it is called for, assists No. 2 in sponging the chamber and bore, and replaces the sponge.

No. 4 removes the filling and air plugs on the right side of the carriage. If the reserve oil tank is not full, he procures a funnel and measure of oil, pours in oil until it overflows through the air hole, replaces the air plug and fills in until the oil stands in the filling hole, replaces the filling plug, and returns the oil measure and funnel.

No. 5 removes the muzzle cover and places it out of the way.

To Load and Fire.

433. *The chief of detachment* indicates the target and range and commands: 1. *No.* —, 2. *With* (such projectile), 3. ***COMMENCE FIRING*** (or, so many rounds, ***COMMENCE FIRING***).

He repeats the command *cease firing.*

After the first round the projectile is named only when a different kind is ordered and the gun is loaded without command immediately after it is fired.

The *gun-pointer* performs the duties prescribed in paragraph 230.

He fires the piece electrically or commands: 1. *No.* —, 2. ***FIRE,*** if the firing circuit is out of order. In simulated firing he calls out *fire* when he closes the firing key, as a signal to load.

No. 1 opens the breech if it is not already open, closes it as soon as the cartridge is inserted, and calls out *ready* as soon as he is clear of the recoil and then watches the gun to see if there is a missfire. (See pars. 219 and 221.)

If there is difficulty in opening or closing the breech, he examines the threads of the breechblock, wipes off any dirt found, and oils the mechanism.

When the use of the *alternative firing cable* is ordered he connects it to the battery and firing pin, holds the firing key in his right hand, and closes the key at the command *fire.*

When *percussion firing* is ordered he turns the percussion firing trigger to a horizontal position on the right and attaches the lanyard. He pulls the lanyard at the command *fire.*

No. 2 receives a cartridge from No. 4 and inserts it, taking care in percussion firing to hold the primer in its seat.

For percussion firing he cocks the firing pin as soon as the breech is closed.

He extracts the empty case after the gun is fired and passes it to No. 7.

No. 3 rams the projectile home with force.

No. 4 passes a cartridge to No. 2. For percussion firing he inserts a primer in the adaptor before passing the cartridge.

Nos. 5 and *6* alternate in bringing a projectile to the right and rear of the breech and inserting it in the chamber, taking care that the point does not strike.

No. 7 places the empty cartridge cases out of the way.

To Unload a Dummy Charge.

434. The chief of detachment commands: *UNLOAD.*

No. 1 opens the breech, No. 2 extracts the cartridge and passes it to No. 7, who replaces it on the cartridge table. No. 5 withdraws the projectile and replaces it on the serving table. No. 1 then closes the breech.

Lights for Night Sights.

435. The lights will not be put into action until required. To put the lights into action, first set the resistance pointers at *off* to avoid running the battery down and then push in the terminal plug for making the circuit and move the resistance pointers around in the direction of the arrow sufficiently to give the smallest quantity of light compatible with distinguishing the sights, so that the eye will not be dazzled.

The circuit should be broken by removing the terminal plug immediately after the firing has ceased, to avoid unnecessarily running the battery down.

AMMUNITION DETACHMENT.

436. Chief of detachment (noncommissioned officer) and 6 privates posted and numbered as follows:

Shell room, Nos. 1, 2, and 3.
Cartridge room, Nos. 4, 5, and 6.

Duties.

Each member of the detachment on reaching his post examines the material to which he is assigned and reports all defects he finds to the chief of detachment.

The chief of detachment exercises general supervision over the supply of ammunition and is responsible that the designated kind is delivered promptly and that all magazine regulations for safety are enforced.

Nos. 1, 2, and *3* carry projectiles of the kind last designated and place them on the table to the right and rear of the gun platform.

Nos. 4, 5, and *6* carry cartridges and place them on the table to the left and rear of the gun platform (or under cover near the parapet).

During hostilities at least ten rounds should be kept near the gun platform, ready for immediate use.

Notes on the Drill.

437. If a cartridge jams and will not go home with the force due to swinging the breechblock smartly, never attempt to drive it home by forcing the block; withdraw the cartridge and try another.

If a cartridge case extracts with difficulty, feel for a burr round the edge of the chamber and, if one is found, file it smooth.

The members of the detachment remain at their posts when the gun is fired and should have cotton in their ears.

DRILL FOR THE 3-INCH GUN.

(On masking parapet mount.)

GUN DETACHMENT.

438. Chief of detachment (noncommissioned officer), gun-pointer (duly qualified noncommissioned officer or private), and 5 privates.

Posts.

439. *Chief of detachment,* 2 yards to the right of the carriage, facing it.

Gun-pointer, immediately in rear of the shoulder piece, facing to the front.

No. 1, 2 feet to the right and rear of the breech, facing it.

No. 2, 2 feet to the left and rear of the breech, facing it.

No. 3, on the right of the gun, near the elevating clamp, facing to the front.

No. 4, 3 feet in rear of the breech, facing it.

No. 5, near the ammunition recess, facing the gun.

The posts of the gun detachment as given above are for inspection and preparatory to the service of the gun.

The men resume their posts on completion of any duty requiring them elsewhere.

The chief of detachment and gun-pointer go wherever their presence is necessary.

Duties.

440. *The gun commander* indicates the target, repeats the commands *commence firing* and *cease firing,* announces the kind of projectile to be used, the order of fire, and, in restricted fire, the number of shots and the firing interval, all in accordance with the orders of the battery commander.

For general duties see pars. 67, 68, 69, 234, 244, 245, 253, 254, and 293.

The chief of detachment is responsible that the gun-pointer identifies the target and that the general instructions given in pars. 209 to 226, inclusive, are carried out. For general duties see par. 244.

The gun-pointer is responsible for the proper regulation of the current for the lights of the night sights. For general duties see pars. 230 to 235, inclusive.

Equipments and Implements.

441. *The gun-pointer* procures the sight and places it in position.

No. 1 procures a silk wiper or cotton waste and a can of lubricating oil for the breech mechanism; he places the can on the base of the carriage and carries the wiper or cotton waste in his belt.

No. 2 procures the lanyard and a silk wiper or cotton waste; he carries the wiper or cotton waste in his belt.

No. 3 procures the ratchet lever and places it on the elevating shaft.

No. 4 equips himself with the hand extractor and a pair of gloves.

Opening and Closing the Breech.

442. *To open the breech:* Rotate the lever handle in one continuous motion to the right until the carrier plate comes to rest against the jacket.

To close the breech: Rotate the lever handle in one continuous motion to the left until the lever brings up against the carrier plate.

To Examine Gun.

443. Each member of the detachment reports all defects he finds to the chief of detachment.

The chief of detachment inspects the gun and carriage to see if all parts are in good order. On completion of the examination he directs the breech to be closed and reports the condition of the piece to the gun commander.

When the gun is to be fired he will examine the recoil cylinder and require it to be filled unless it be already full.

The gun-pointer frees the traversing clamp and the elevating clamp on the left of the cradle, inspects the sight, tests the elevating gear, and, at night, the circuit for the night sights.

No. 1 removes the breech cover and places it out of the way, opens the breech, examines the breechblock and breech mechanism, cleans them if necessary, oils all the bearing parts and the threads of the breechblock, and closes the breech when directed.

No. 2 reeves the lanyard, examines the bore, chamber, and breech recess, cleans them if necessary, and oils the threads of the breech recess.

If the bore or chamber needs cleaning, he procures the sponge and uses it.

No. 3 removes the tompion and places it out of the way.

No. 4 adjusts the resistance of the light circuit for the night sights under the direction of the gun-pointer.

To Load and Fire.

444. *The chief of detachment* indicates the target and range and commands: 1. *No.* —, 2. *With* (such projectile), 3. ***COMMENCE FIRING*** (or, so many rounds, ***COMMENCE FIRING***).

He repeats the command *cease firing.*

After the first round the projectile is named only when a different kind is ordered and the gun is loaded without command immediately after it is fired.

The gun-pointer performs the duties prescribed in par. 230 and, when the gun has the proper elevation, commands and signals ***CLAMP.*** He fires by lanyard and in simulated firing calls out *fire* when he pulls the lanyard, as a signal to load.

No. 1 opens the breech, if it is not already open, closes it as soon as the cartridge is inserted, and calls out *ready* as soon as he is clear of the recoil.

If there is difficulty in opening or closing the breech, he examines the threads of the breechblock, wipes off any dirt found, and oils the mechanism.

No. 2 receives a round of ammunition from No. 5 and inserts it in the chamber, taking care that the point of the projectile does not strike.

If there is difficulty in opening or closing the breech, he examines the threads of the breech recess, wipes off any dirt found, and oils the threads if they become dry.

No. 3 clamps the gun in elevation at the gun-pointer's command and unclamps immediately after the gun is fired.

No. 4 receives the empty cartridge case as it is ejected and lays it aside. He uses the hand extractor when necessary.

No. 5 brings a round of ammunition of the designated kind from the recess and passes it to No. 2.

To Unload a Dummy Charge.

445. The chief of detachment commands: *UNLOAD.*

No. 1 opens the breech, No. 4 receives the round of ammunition and passes it to No. 5, who replaces it in the recess.

No. 1 closes the breech.

Lights for Night Sights.

446. The lights will not be put into action until required. To put the lights into action, first set the resistance pointers at *off* to avoid running the battery down and then push in the terminal plug for making the circuit and move the resistance pointers around in the direction of the arrow sufficiently to give the smallest quantity of light compatible with distinguishing the sights, so that the eye will not be dazzled.

The circuit should be broken by removing the terminal plug immediately after the firing has ceased, to avoid unnecessarily running the battery down.

To Raise and Lower the Gun.

447. *To raise the gun:* The chief of detachment commands: *RAISE GUN.*

No. 4 mans the ratchet lever, engages the lower tooth of the lever pawl, sets the ratchet-wheel pawl to prevent rotation to the left, and then operates the lever and raises the gun. As soon as the pivot socket is clamped he removes the ratchet lever and lays it on the base of the carriage.

No. 3 sets the clamp to hold the pivot socket in position and tightens the clamp set screws.

To lower the gun: The chief of detachment commands: ***LOWER GUN.***

Nos. 3 and *4* reverse the movements prescribed for raising the gun, first traversing the gun to bring the muzzle opposite the muzzle recess.

AMMUNITION DETACHMENT.

448. Chief of detachment (noncommissioned officer) and two privates, Nos. 1 and 2, posted in the magazine.

Duties.

Each member of the detachment on reaching his post examines the material to which he is assigned and reports all defects he finds to the chief of detachment.

The chief of detachment exercises general supervision over the supply of ammunition and is responsible that the designated kind is delivered promptly and that all magazine regulations for safety are enforced.

Nos. 1 and *2* carry ammunition of the kind last designated and place it in the ammunition recess.

During hostilities at least ten rounds should be kept in the recess ready for immediate use.

Notes on the Drill.

449. It is sometimes necessary to secure the traversing clamp lever to prevent undue tightening of the clamp during firing.

The cylinder is most conveniently filled by detaching it from the cradle.

If a cartridge jams and will not go home with the force due to swinging the breechblock smartly, never attempt to drive it home by forcing the block; withdraw the cartridge and try another.

If a cartridge case extracts with difficulty, feel for a burr round the edge of the chamber, and, if one is found, file it smooth.

The members of the detachment remain at their posts when the gun is fired and should have cotton in their ears.

DRILL FOR THE 6-POUNDER GUN.

(Driggs-Seabury screw-block breech mechanism and parapet mount.)

GUN DETACHMENT.

450. Chief of detachment (noncommissioned officer), gun pointer (duly qualified noncommissioned officer or private), and 6 privates.

Posts.

451. *Chief of detachment,* 2 yards to the right of the trail, facing to the front.

Gun-pointer, immediately to the right of the trail, facing to the front.

No. 1, 2 feet to the right and rear of the breech, facing it.

No. 2, 2 feet to the left and rear of the breech, facing it.

No. 3. immediately to the left of the end of the trail handspike, facing to the front.

No. 4, near the ammunition recess, facing the gun.

Nos. 5 and *6,* in the magazine.

The posts of the gun detachment as given above are for inspection and preparatory to the service of the gun.

The men resume their posts on completion of any duty requiring them elsewhere.

The chief of detachment and gun-pointer go wherever their presence is necessary.

Duties.

452. *The gun commander* indicates the target, repeats the commands *commence firing* and *cease firing,* announces the kind of projectile to be used, the order of fire, and, in restricted fire, the number of shots and the firing interval, all in accordance with the orders of the battery commander.

For general duties see pars. 67, 68, 69, 234, 244, 245, 253, 254, and 293.

The chief of detachment is responsible that the gun-pointer identifies the target and that the general instructions given in pars. 209 to 226, inclusive, are carried out. For general duties see par. 244.

The gun-pointer.—For general duties see pars. 230 to 235, inclusive.

Equipments and Implements.

453. *The gun-pointer* procures the sight and places it in position.

No. 1 procures a silk wiper or cotton waste, which he carries in his belt.

No. 2 procures the lanyard and a silk wiper or cotton waste, hooks the lanyard to the eye of the lanyard button, and carries the wiper or cotton waste in his belt.

No. 3 procures a wrench for the filling plug.

No. 4 procures the tool box and places it under cover convenient to the gun.

Opening and Closing the Breech.

454. *To open the breech:* Rotate the lever handle in one continuous motion to the right until the carrier plate comes to rest against the jacket.

To close the breech: Rotate the lever in one continuous motion to the left until the lever handle brings up against the carrier plate.

To Examine Gun.

455. Each member of detachment reports all defects he finds to the chief of detachment.

The chief of detachment inspects the gun and carriage to see if all parts are in good order. On completion of the examination he directs the breech to be closed and reports the condition of the piece to the gun commander.

The gun-pointer inspects the sight.

No. 1 removes the breech cover and places it out of the way, opens the breech, examines the breechblock and breech mechanism, cleans them if necessary, and oils all the bearing parts and threads of the breechblock.

No. 2 examines the bore, chamber, and breech recess, cleans them if necessary, and oils the thread of the breech recess. If the bore or chamber needs cleaning, he procures the sponge and uses it.

No. 3 removes the filling plug. If the cylinder is not full, he procures a funnel and measure of oil, pours in oil until it stands in the filling hole, replaces the filling plug and the oil measure and funnel, and places the trail handspike in its seat.

No. 4 removes the tompion and places it out of the way.

To Load and Fire.

456. ***The chief of detachment*** indicates the target and range and commands: 1. ***No.*** —, 2. ***With*** (such projectile), 3. ***COMMENCE FIRING*** (or, so many rounds, ***COMMENCE FIRING***).

He repeats the command ***cease firing.***

After the first round the projectile is named only when a different kind is ordered, and the gun is loaded without command immediately after it is fired.

The gun-pointer performs the duties prescribed in paragraph 230, and directs No. 3 in giving the approximate direction to the gun. When using the telescopic sight, for deliberate fire at long range, he operates the traversing and elevating clamps, directs No. 1 in giving direction and elevation, and commands: 1. ***No.*** —, 2. ***FIRE,*** signaling ***fire*** by raising one hand to the height of the head; when using the open sight he places his right shoulder firmly against the shoulder piece and grasps the handle with the left hand and the top of the shoulder piece with the right hand while aiming and fires by lanyard.

In simulated firing he calls out ***fire*** when he pulls the lanyard, as a signal to load.

No. 1 opens the breech, if it is not already open, closes it as soon as the cartridge is inserted, calls out ***ready*** as soon as he is clear of the recoil, and then watches the gun to see if there is a missfire. (See pars. 219 and 221.)

If there is difficulty in opening or closing the breech, he examines the threads of the breechblock, wipes off any dirt found, and oils the mechanism.

When the open sight is used he operates the traversing and elevating clamps as directed by the gun-pointer.

When the telescopic sight is used he takes position at the shoulder piece after closing the breech, gives direction and elevation as directed by the gun-pointer, and fires at the gun-pointer's signal.

No. 2 receives a round of ammunition from No. 4 and inserts it in the chamber, taking care that the point of the projectile does not strike.

If there is difficulty in opening or closing the breech, he examines the threads of the breech recess, wipes off any dirt found, and oils the threads if they become dry.

No. 3 grasps the trail handspike with both hands, the right hand near the end, and gives the approximate direction as directed by the gun-pointer.

No. 4 brings a round of ammunition of the designated kind from the recess and passes it to No. 2.

Nos. 5 and *6* bring ammunition of the designated kind from the magazine and place it in the ammunition recess.

To Unload a Dummy Charge.

457. The chief of detachment commands: ***UNLOAD.***

No. 1 opens the breech, No. 2 receives the round of ammunition and passes it to No. 4, who replaces it in the recess.

Notes on the Drill.

458. There is no ammunition detachment and the chief of the gun detachment is in charge of the magazine except when two or more guns are supplied from the same service magazine, in which case an additional noncommissioned officer is placed in charge of it with duties as prescribed in par. 448.

During hostilities the ammunition boxes will be habitually filled with ammunition for use in an emergency.

When this ammunition is used No. 2 takes it from the left box or receives it from No. 1, who takes it from the right box.

If a cartridge jams and will not go home with the force due to swinging the breechblock smartly, never attempt to drive it home by forcing the block; withdraw the cartridge and try another.

If a cartridge case extracts with difficulty, feel for a burr round the edge of the chamber, and, if one is found, file it smooth.

If the gun is to be fired in a temporary emplacement where no permanent anchorage is provided, one should be improvised and made as substantial as possible in order that the recoil may be sufficiently controlled to enable the gun-pointer to remain against the shoulder piece, use the short lanyard, and thus secure the maximum rate of aimed fire.

Whenever the gun is not securely anchored the long lanyard will be used, the spade will be turned down, and Nos. 1 and 2 will step clear of the recoil outside the wheels before the gun is fired.

If No 3 has difficulty in giving direction by the handspike, the gun-pointer will direct Nos. 1 and 2 to assist by working on the wheels.

DRILL FOR THE 6-POUNDER GUN.

(Driggs-Seabury drop-block breech mechanism and parapet mount.)

459. The drill is the same as in pars. 448 to 458, with the following modifications:

To open the breech: Rotate the operating handle to the rear.

To close the breech: Rotate the operating handle smartly to the front.

No. 2 opens and closes the breech and calls out *ready* instead of No. 1.

Omit all reference to threads of the breechblock and breech recess.

DRILL FOR THE 6-POUNDER GUN.

(American Ordnance Company, drop-block breech mechanism and parapet mount.)

460. The drill is the same as in pars. 448 to 458, with the following modifications:

To open the breech: Rotate the operating handle smartly to the rear.

To close the breech: Rotate the operating handle to the front.

No. 2 opens and closes the breech instead of No. 1.

No. 1 operates the elevating handwheel under direction of the gun-pointer.

Omit all references to the shoulder piece, the long lanyard, the clamps, and the threads of the breechblock and breech recess.

ARTILLERY COMMUNICATIONS.

461. The artillery engineer is responsible for the maintenance of all lines of communication. He should inspect all lines weekly, examining all the instruments and testing all batteries. If any instrument or line is found out of order, it will be repaired at once.

Battery commanders are responsible for all instruments pertaining to their batteries. They should inspect every line daily, causing the operator's tests to be made with each instrument.

These inspections will be full and searching. to insure the lines being kept in thoroughly good condition.

All officers responsible for instruments must familiarize themselves with their construction and operation and must understand how to make the tests necessary to locate the usual troubles that develop in service. They will see that the operators also understand the operator's tests, and will specially see to it that no part of an instrument is dismounted for repairs until a test has shown that the fault probably lies in that part.

The artillery engineer will make a test of the *resistance* and *insulation resistance* of each line at least once during each year. The resistance and insulation resistance of each line shall be entered in a record book kept for the purpose, whenever such test is made. Whenever a line is found to be deteriorating it will be tested every six months, and a full report giving all data will be made to the district commander as to its condition.

In order that these tests may be made with accuracy and without too great interference with the drill, all lines shall be so installed that they can be tested as prescribed without confusion in restoring lines of communication. While the lines of any particular battery are being tested any drill which would interfere with such test will be suspended.

These rules apply to both telephone and telautograph lines.

Telephone Drill.

462. While the use of a telephone is a very simple thing, yet to teach men to hear clearly and to speak so as to be understood requires careful training. Care will be taken in selecting operators. Many men not considered as deaf are partiallv deficient in hearing, which prevents their distinguishing certain sounds; this is particularly true in telephone work. In selecting telephone operators the men will be tested carefully as to their ability to distinguish sounds in a telephone. Enunciate distinctly through the telephone letters which sound somewhat alike, as B, D, C, P, T, E, and ascertain whether they can distinguish them readily. Enunciate a number of words beginning with S, such as seven, six, sight, sound, etc., and then try them with such words as four, more, score, door, bore. After a test of this kind with an instrument in good order try them with an instrument which is not working well.

After the hearing test, give them a number of selected words to send through the telephone in order to test their ability to unciate distinctly.

Other qualifications being equal men should be selected who are in the habit of speaking slowly and distinctly. A man who raises the pitch of his voice when excited should not be selected.

Selected operators should have a sufficient knowledge of their instruments to correct minor defects and be able to determine where the trouble lies, even though they can not remedy it.

The operator should be familiar with all the parts of the telephone and what each part is supposed to do and how it does it. He should be thoroughly instructed in the use of the operator's test. (See Manual for Coast Artillery.)

Inspection.

463. Upon opening his station the operator will adjust the head gear of his instrument and raise and lower the hook switch. If this operation results in a sharp click in his ear, the instrument is in working order. Should no click be heard, the binding post to which his head set is connected should be examined and tightened. Should the hook test indicate that there is no battery on the line, the operator should move his battery switch to *local battery.*

The above refers to the composite artillery-type telephone. For any special modification of this system the test will be modified to correspond to the character of the installation.

For any other telephone system the following general rules will apply:

1. Look over all binding posts and connections and see that none are loose.

When lightning arresters are used pass a sheet of paper between the arrester carbons, seeing that the center one touches neither of the others.

2. Unhook the receiver and see that the lever goes all the way up, making good contacts.

3. Make the general test prescribed for the artillery-type telephone.

4. Examine the cells of the local battery, noting the following points: See that the binding posts are tight and the connections good, with no green substance on the wires or posts; see that the water in the jars is up to the prescribed point, about 1 inch from the neck of the cell; see that the zincs and carbons are not touching, that the zinc of one cell is connected with the carbon of the other, that the zincs are not used up, and that there are no crystals on the zincs or carbons. If the cells have not been kept i

good order, it may be found that the ends of the wires have been eaten through at the binding posts. The operator should correct any defects that he can and report the others.

To Open Station.

464. Hang up the receiver, ring the signal for the station wanted and wait for a reply. When there is more than one station on the line, each station should have a special signal, which should be used in calling and answering. Give two turns of the crank for a short ring and four for a long ring.

As soon as the called station has replied by signal take down the receiver and place it to the ear and call the name of the station and wait for a verbal reply before sending a message.

To Use the Telephone.

465. Although a simple operation, care must be taken to do this properly.

In speaking into the transmitter the head should be held in a natural position, the lips about an inch from the transmitter.

Use a moderate tone of voice and speak slowly and distinctly, being careful not to slur the words or syllables, but to enunciate clearly each sound.

Never shout or raise the pitch of the voice.

Send numerals singly; thus, 4370 is sent *four*, *three*, *seven*, *zero*. Never use the letter O for zero. 7864 may be sent as *seven*, *eight*, *six*, *four*, or a slight pause may be made between the couples, that is, between the second and third numeral, thus, *seven*, *eight—six*, *four*. When sending three figures the first one may be sent singly, followed by the remaining two; thus, 345, *three—four*, *five*, or they may be sent without the pause. In sending an azimuth or any number involving a decimal, the decimal point is called *point;* 246.34 is sent *two*, *four*, *six*, *point*, *three*, *four*. An exact hundred should be sent as a hundred; thus, 200 is sent as *two hundred*, 4500 is sent as *four*, *five*, *hundred*. The same system applies to sending an exact thousand; 4000 is sent as *four thousand*.

If it is necessary to repeat, use more care as to distinctness, but do not raise the voice. A single number not understood may be accentuated by counting up to it and emphasizing it. Thus, if the figure four is not understood, say FOUR; one, two, three, FOUR.

The advantage of using the names of the single digits is as follows: No two of the digits one, two, three, four, five, six, seven, eight, nine, and zero sound alike and with two exceptions each is a word of but one syllable. If the letter O is used for zero it is sometimes mistaken for four. Fifteen, fifty, and sixty are sometimes easily mistaken for one another. Sixteen may also sound like sixty, seventeen like seventy, and so on.

In receiving observe the following rules:

1. Keep the mind on the message; a person can not receive correctly when he is thinking of something else.
2. Keep the receiver close to the ear.
3. Do not interrupt the sender unless absolutely necessary.
4. Caution the sender when he is speaking too loudly, not loudly enough, or too rapidly.

To Close Station.

466. After sending (or receiving) the order to close station, hang up the receiver.

TELAUTOGRAPH DRILL.

467. In order to obtain efficient service from tne telautograph system the following conditions are essential:

1. The power must be sufficient to supply at the telautograph a direct current of sufficient voltage and of fairly uniform potential. No sudden variation of voltage of more than ½ volt must occur.
2. The power mains must be in good order, and all line wire connections must be carefully and securely made.
3. Transmitter and receiver condensers must suppress sparking at buzzer and relay contacts, respectively. If they fail to do this, and their connections are found to be good, replace them with new ones.
4. The fields of the instruments must be properly set for the voltage to be used. When once set by means of the suspension springs, these springs must not be changed unless there has been a permanent change of voltage of at least 8 volts above or below that for which the fields were set.
5. The relay must close its contact with certainty.
6. The paper shifter and pen lifter must work promptly and not falter. The relay must open the paper-shifter switch when energized and close it when de-energized.
7. Blown fuzes must be replaced by good ones.

8. The pencil lead must be long enough to depress the unison point; the pen must be clean and adjusted to enter the hole in the ink bottle; it must also be adjusted to give a suitable width of line.

9. The paper must be dry, must not be torn or have any holes in it, and it must be carefully put in to avoid sticking.

10. The concave side of right and left potential changer in the transmitter must be carefully cleaned to insure good contact with the rollers. Avoid use of oil on these parts.

11. The buzzer must be adjusted so that its action can be heard when the current is turned on.

12. Moving parts of the receiver must be kept clean and free from unusual friction or binding. Pivot and ball and socket joints must be lightly oiled with very thin oil.

13. Connections in transmitter and receiver sockets must be securely made.

Plugs must be inserted as far as they will go.

14. Ink bottles must have a sufficient supply of ink and be tightly corked. Ink must be thin enough to flow freely; if too thick, add alcohol.

It is the duty of the artillery engineer and his experts to maintain the first four conditions. The fifth and sixth conditions can usually be regulated by the operator unless something is broken or the trouble is due to one of the first four conditions. It is the duty of the operator to maintain the remaining conditions.

In a private-line system the operator in the primary or most important station is called the *operator,* the operator in the other station being designated the *second operator.* In a series line the man who uses the transmitter is called the *operator* and the men at the receivers *readers.*

Primary Inspection.

468. As soon as the operators and readers reach their stations they will inspect their instruments carefully, cleaning the instrument if necessary, clean the pen, note if the paper is dry and if not replace it with some that is dry, examine the ink and see that there is a sufficient amount in the bottle, that the hole is not clogged and that the ink runs freely; if necessary, empty the bottle and replace the ink. The operator will then turn on the current, and the second operators and readers will report by telephone to their operators *ready for test.*

The operators will then close the master switch, make a field, write a sentence, and open the master switch.

If everything is in working order, the second operators will report O K on the telautograph. If not, they will preferably report the trouble by telephone to save time. Readers report by telephone.

If the instrument fails to work at all, the operators will inspect to see that the switches are properly closed and that the fuses are intact, replacing broken fuses by new ones. *Always throw away broken fuses.*

Test will also be made to ascertain whether there is any power on the line. If the operator is unable to make the instrument work, he will report the fact to the officer in charge of the station.

Should the relay, paper shifter,. or pen lifter fail to work freely, he will endeavor to adjust it; if he finds it broken or so much out of order that he can not adjust it, or finds that the trouble is due to the power, he will report the fact.

To adjust the field.—If the field goes too far to the right, there is too much power; put in more resistance by the rheostat. If the field does not go far enough to the right, cut out resistance. *Under no circumstances should an operator alter or adjust the springs.* These springs are adjusted for a certain allowable variation in voltage. The voltage may temporarily fall below the minimum, or the voltage may be so great that it can not be sufficiently cut down by the rheostat; under these conditions it is better to use a bad field than to attempt to adjust by the springs. If adjustment is made by the springs, when the current returns to its normal condition the instrument would be entirely out of adjustment.

Different actions of the pen indicate different kinds of trouble. The Manual for Telautographs gives the probable cause of trouble for each peculiar action of the pen. Operators should be familiar with the instructions in order to be able to determine instantly the probable cause of trouble.

To Operate the Telautograph.

469. The actual operation of the telautograph is very simple; it consists in closing the master switch and writing the message upon the platen, shifting the paper when necessary, and opening the master switch when the message is written.

To close the master switch.—Depress the button latch with the point of the pencil and draw the lever of the master switch toward you with the left hand, then release the latch by lifting the pencil; this will lock the lever maintaining the switch (which is a spring switch) closed.

To open the master switch.—Depress the button with the point of the pencil; this will release the lever and the switch will fly open.

To shift the paper.—Depress the button latch with the point of the pencil, and hold it down during the entire operation, then move the lever back and forth its full stroke as many times as may be necessary; each stroke shifts the paper a certain amount. After shifting the paper, if the writing is to be continued, the switch could be left closed, otherwise it should be left open.

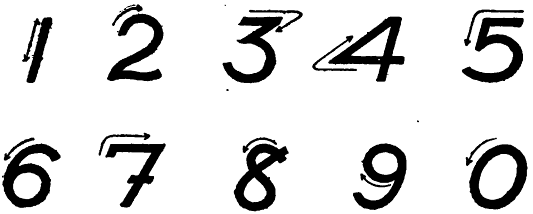
Never depress the button with anything but the telautograph pencil.

Precautions.

1. Hold the pencil as nearly vertical as possible.
2. Do not rest the hand on the platen, otherwise the pen at the receiver will not lift, as the lifting of the pen is accomplished by allowing the platen to rise when the pencil is lifted.
3. See that the lead in the pencils protrudes a sufficient distance and is properly sharpened.
4. Write in a clear round hand, and fairly rapidly.
5. Always open the master switch when the message is complete.

The last rule is exceedingly important, especially in using the gun line. There is a tendency for operators to keep the current on, and hold the pencil ready for the next message, in order to gain time. This keeps the pen at the receiver out of the ink, and the ink used in the telautograph dries very rapidly; the result is that after a few messages the pen fails to write, or writes very illegibly. If the ink has been allowed to harden in the pen, it does not take up ink readily and produces blurred writing.

Figures should be made as follows, the arrow indicating the direction in which the pencil moves:



It sometimes happens that both operators start to write at the same time. In case this happens, one must instantly give way and open his master switch. Generally the operator has the right of way and the second operator must open the switch, but data from the secondary station has the right of way.

Selection of Operators.

470. As the principal duty of the operator of a telautograph is to send ballistic data, it is important that the operator should be a trained gunner, one who understands the meaning of the data sent, who is familiar with artillery technical terms, and can readily comprehend the purport of the message sent and received. He should be able to write a good round and legible hand fairly rapidly.

He should have sufficient manual dexterity to be able to clean and adjust the delicate parts of the instrument. He should be familiar with the names of the different parts of the apparatus and what each part is supposed to do and how it does it. He should be thoroughly instructed in any tests that he is required to make.

SEARCHLIGHT DRILL.

Equipment.

471. It is impracticable to give the equipment or the manning parties in the same detailed manner as for other artillery work, as they depend upon the number and kind of searchlights in the battle command and upon local conditions.

The searchlight officer is stationed in the observing room of the battle commander's station. The station is equipped with an electric controller for every searchlight under electrical control; these are in the observing room. Speaking tubes connect the searchlight officer with the telephone booths in the telephone room. The searchlight officer also has a directing telephone which may be switched on to any of the searchlight telephone lines.

In the telephone room there are as many booths as there are telephone lines to the various searchlights. In each booth is a telephone connected with a searchlight, and a speaking tube to the searchlight officer's station.

Manning Parties.

472. *At the battle commander's station:*
  The searchlight officer.
  One operator for each electric controller.
  One telephone operator for each telephone line.
For searchlights:
  36-inch and smaller lights—
    If actuated from a central plant—
        One operator.
        One assistant.
    If actuated from a local plant—
      Gas engine—
        One operator.
        One assistant.
        One engineer.
      Steam engine—
        One operator.
        One assistant.
        One engineer.
        One stoker.
In addition to the above:
For movable lights, a sufficient detail to move the plant.
For lights above 36-inch, one assistant.
For each fixed searching light, two watchers and a signal detail.
For each roving searching light, one watcher.
A signal detail for each signal station.

Service of the Lights.

473. All searchlights must be kept occulted when not in use searching or illuminating. Illuminating and mine-field lights will be put in use only when ordered from the battle commander's station, except in case of emergency.

Fixed searching lights are intended to demarcate the outer limit of the battle area and to detect any vessel entering it. Two watchers should be stationed on each side of the light, at such distances from it that they can readily detect any vessel passing under the beam. Anything passing under the beam must be instantly reported to the battle commander's station. A signal station should be established outside of each fixed light to communicate with picket boats. Messages received will be immediately transmitted by telephone to the battle commander's station.

Each night the two fixed lights must be fitted with new carbons, one light being fitted with a full-length carbon and one with a half-length carbon; after this, when carbons are renewed, full-length carbons will be used. The object of this rule is that the two lights will not have to change carbons at the same time.

Whenever it is necessary to occult a light, to change carbons, or for any other reason, it must be reported to the searchlight officer before the light is occulted in order that a relieving light may be assigned to this sector.

A point is said to be *inside of a beam* when it lies between the battle commander's station and a line passing through the axis of the beam, and *outside of a beam* when it lies on the opposite side; it is *within the beam* when it is illuminated by the beam either directly or by the reflected ray.

A light is *moving out* when it is moving from the battle commander's station, and *moving in* when it is moving toward the battle commander's station. The fixed lights move in and out across their fixed sectors with a slow motion, the two lights as a rule acting together, that is, *moving out* and *in* simultaneously, always maintaining their intersection. To obtain this motion one of the lights will be designated as the directing light, the motions of which will be followed by the other. The inclination of these lights with the horizon should be such that the point of intersection of the two lights will be above the water, but not more than 30 feet above it.

Roving searching lights are intended to search the battle area within the fixed lights. The rule for carbons is the same as for fixed lights. Only one watcher is required, who will be stationed on the *outside* of the light, anything inside of the beam can be seen from the battle commander's station. A roving light which is intended to relieve a fixed light will have a sector marked out within which it must search when ordered to relieve a fixed light.

The *searchlight area* of each roving light will be divided into three or more sectors designated as the right, middle, and left sector; or in case of four sectors, right, right middle, left middle, and left sectors. The term middle is preferable to center, as it is more readily transmitted through a telephone. These sectors are used for the purpose of controlling the lights by telephone. Roving lights are under the direct control of the searchlight officer.

When searching, the lights are moved through the designated sector slowly from right to left and back, the beam being kept as nearly horizontal as possible, depending upon the height of the light. The inclination to the horizon should be such that at the outer limit of the searchlight area the beam will be above the water, but not more than 30 feet above it; it should not be allowed to strike the water unless so ordered by the searchlight officer when it is required to illuminate some small boat which is not sufficiently illuminated by the reflected ray. The search is maintained through the entire area assigned to the light, unless orders are received to search a particular sector, or to illuminate a particular vessel or spot.

When a roving light picks up a vessel the beam is kept directly over the vessel, the vessel being *followed,* and the fact that something is in the beam is reported by the watcher to the searchlight officer. The light continues to *follow* until it is ordered to *search.*

Illuminating lights are under the control of the fire commanders, but during the watching period they may also be used for searching by the searchlight officer. It will often happen that during this period an illuminating light must be used to replace a roving light for searching, while the latter is changing carbons or when it is for some reason out of action, or when it is relieving a fixed light. An illuminating light may be used in two ways for searching, viz: The fire commander may be directed to search, when the searching is done under the orders of the fire commander, or the light may be controlled by the searchlight officer by means of the telephone, in which case the operator acts under the order of the searchlight officer. In order to facilitate the use of illuminating lights for searching, their areas will also be divided into sectors. No special watchers are needed for the illuminating lights, the watching being done from the fire commander's station.

Mine-field lights are under the control of the mine commander, but may be used under the searchlight officer for searching when no attack is anticipated upon the mine field; and when so used they are used in the same ways as prescribed for illuminating lights when used for searching.

They may be used to illuminate the channel in order to light the way for the entrance of friendly vessels, but under no other circumstances should a mine field be illuminated. It is a matter of fundamental importance that the entrance to the inner harbor, the mine fields and the shore line in front of the fortifications should be kept in darkness if possible.

When an attack is being made on the mine fields every effort should be made to deceive the enemy as to their position by keeping the lights searching over an area outside of the mine fields, at the same time, of course, illuminating the attacking boats for the defending batteries. The mine fields should not be illuminated until the boats approach one of the fields.

The battle commander's light is under the control of the searchlight officer, and is electrically controlled from the battle commander's station. It is used for searching, for indicating, or for illuminating.

Designation of Searchlights.

474. The battle commander's light is known as the *battle light,* usually abbreviated to *battle,* the word light being understood.

Searching lights are designated by letters, as *Light A,* abbreviated to *A,* the word light being understood.

Illuminating lights are numbered to correspond to the number of the fire command, or are known by the names of fire command to which they belong. Thus, *No. 1* is the illuminating light of the first fire command. *No. 2 Wadsworth* is the illuminating light of the second fire command at Wadsworth, and *No. 1 Hamilton,* that of the first fire command at Hamilton.

The mine-field lights are designated as *mine,* or *mine 1, mine 2,* etc., if there are more than one.

Searchlight Commands.

475. It is very difficult under the most favorable circumstances for a searchlight officer to exercise accurate control of searchlights by telephone. The officer thinks that he sees something in a certain direction, but until it is illuminated its range can not be determined. Therefore there is no means of relocating it to the searchlight station. The officer must simply make a guess as to the particular sector in which it lies. He directs the light to search this sector, endeavoring to control its motion by commands. The searchlight operator may pass directly over the object without seeing it, and as he has no idea as to its distance from his station he may be watching in one place while the officer is trying to search another. It is therefore necessary that the commands shall be concise, readily transmitted by telephone, and convey to the operator a definite meaning.

The following commands may be modified or added to in order to meet the requirements of any local conditions.

In action signifies to bring an occulted light into action. The commands will be given as follows: *C in action, No. 1 in action, No. 2 Hamilton in action,* etc.

Out signifies to take a light out of action. The commands will be given as follows: *C out, No. 1 out,* etc.

Search signifies that the light is to search its entire area. The commands are as follows: *C search, Mine search,* etc. If the light is to search but a certain sector, the command is: *C search right, D search middle and left,* etc. If a light has been directed to search a particular sector and it is desired that it shall return to searching the full area, the light is designated and the command *search* given.

Follow signifies that the light is to follow a vessel within its beam even if the vessel passes out of the sector in which the light has been ordered to search.

Cover signifies that a designated light is to cover a target illuminated by some other light. Thus, *C cover battle* signifies that light *C* is to cover the target illuminated by the battle commander's light.

Uncover signifies that a covering light is to uncover the vessel and to continue to search as previously ordered. The command *search* given to a searching light covering a vessel indicates that the light is to uncover and continue to search its entire area, no matter what the previous orders may have been. The commands are given as follows: *D uncover,* or *No. 1 uncover battle and cover D,* etc. In the last command the order for *No. 1* to cover *D* would be sufficient, but it is better to direct a covering light to uncover one target before ordering it to cover another, as it indicates to the operator that no mistake has been made, otherwise the operator may consider it to be his duty to remind the searchlight officer that he is covering a target.

Adjust given to a particular light directs the operator to adjust his focus.

Spread directs a certain operator to spread his beam.

Contract directs a certain operator to contract his beam.

Raise (or *lower*) directs an operator to raise (or lower) his beam. The amount may be stated, as raise 5° or raise slightly. Operators should be instructed in estimating the elevation of their beam in degrees; they ought to be able to judge for each 10 es if not for 5.

Elevate directs that the beam shall be raised to 30° and held there until further orders. This may be modified by indicating a certain degree as, elevate 20°. The object of this command is to get an interfering light temporarily out of the way without losing its direction. To return the light to its original position and work the command is *down.*

Hold signifies that the light is to be held at a certain azimuth. If the light is being moved under the direction of the searchlight officer and the command *hold* is given, the light must be instantly stopped. Slight motions to the right or left are indicated by the commands *move right* or *left,* the command *steady* indicates that the beam is approaching the object and that the motion should be very slow.

Selection and Instruction of Operators.

476. A searchlight operator should be a man of intelligence and preferably one who has had experience in the use of electrical and mechanical apparatus. A man who has had no electrical experience is apt to be afraid of the current and timid about handling the instrument; if he has had no mechanical experience, he is apt to be afraid to turn a screw or make an adjustment for fear that he will get something out of order. On the contrary a man who has an inventive turn of mind is apt to get the apparatus out of order by experimenting. A good searchlight operator can only be made by careful training and constant practice. He should be interested in his work and appreciate its importance. It must be impressed upon him that he will usually be stationed at a distance from the command and must learn to rely upon himself, and that success or failure may depend upon the manner in which he handles his light. Operators should not be changed about from light to light, as no two lights require precisely the same handling or adjustment. They should be permitted on nights when there is no night drill, under the supervision of an officer or competent electrician sergeant, to experiment with the adjustment of their lights and as to the proper amount of current to use to produce the best illumination.

When an operator has proven himself to be an expert in the use of his light, assistants should be detailed to assist him during drill for purposes of instruction.

An operator should be instructed in the names and use of various parts of the light and in its care, and should thoroughly understand the mechanical principles involved. He should al be constantly practiced in the orders by means of which telephonic control is maintained. An operator of a light controlled by telephone should be a good telephone operator and during drill and action should wear the head receiver in order that he may receive his instructions directly.

An operator should also be trained by experience to distinguish between the various grades of carbon and to select the grade best suited to his light. He should be instructed in cleaning and keeping his mirror in first-class condition.

Not only do different lights require different adjustment, but also currents of different voltage and amperage; in fact, each grade of carbon used will require a different voltage.

Very few officers appreciate the importance of the careful training of searchlight operators and the careful study of each light in order to obtain the best results.

ROUTINE DUTIES.

General Instructions.

477. The artillery district commander will assign officers to the command of the several battle, fire, and mine commands.

478. Companies are assigned to particular batteries by artillery district commanders. This assignment will be made in accordance with the assignment to calibers published annually by the War Department. When the batteries at a post constitute more than one fire command, these assignments will be made so as to have, if practicable, a complete fire command in commission.

479. All fire commanders and superior commanding officers will attend all artillery drills and practice.

If the number of field officers present is equal to or less than the number of fire commands in commission, all field officers present will habitually act as fire commanders, except on occasions of drills in which some of them actually exercise higher command.

480. Duties connected with the care of the armament and its efficient use will be given precedence without exception over other post duties.

481. The artillery district commander will prescribe the hours for artillery instruction at all posts in his district and its general character.

482. As far as practicable artillery drill will be held simultaneously at all posts in the same battle command. Whenever there is a launch or tug under control of the district commander, it will be used during the drill period as a moving target for vessel tracking.

483. Artillery drill will be held daily, weather permitting (Saturdays, Sundays, period of indoor instruction, and holidays excepted), and shall include district commander's drill, battle commander's drill, fire commander's drill, and battery drill, each of which shall be held sometimes at night.

The maintenance of communications, the operation of electric light and power plants, including storage batteries, and the prescribed instruction in submarine mine work are to be considered as artillery drill.

Night Drill.

484. There are two kinds of night drill—battery night drill and battle and fire command drill. The former is for the instruction of the position-finding details and gunners in the use of their instruments at night, the latter is for the instruction of the battle command in the use of searchlights and in battle tactics at night.

Battery drill.—The tug without a target will be sent out on the range and kept illuminated by a single searchlight to enable the battery commanders to practice their men in position finding and pointing at night. The movements of the tug will, when necessary, be controlled by signals.

Battle and fire command drill.—The tug, without a target, will be sent out a sufficient time in advance to enable it to get beyond the maximum range before the drill begins. At the appointed time it will turn and come in or move according to instructions. All lights aboard, except those absolutely necessary to comply with the laws of navigation, will be kept extinguished during the drill.

In a battle command equipped with the prescribed lights, all illuminating lights will be occulted and the searchlight officer will be required to pick up the tug by means of his searching lights alone. As soon as the tug has been picked up, the battle commander will assign it as a target to the various fire commands.

In a battle command not fully equipped with lights, certain lights will be assigned as searching lights and others as illuminating lights. The searchlight officer must first pick up the tug by the searching lights before any illuminating lights are us

Each illuminating light must be kept occulted until the tug is picked up and a target assigned to it.

Searchlights will always be used as prescribed in searchlight drill.

Should the battle commander desire to repeat the run, he will cause all but one light to be occulted and the proper signals to be made.

District drill.—Using all tugs and launches available, the district commander will conduct combined artillery drill and tactical exercises of all the artillery elements of defense of his district.

Indoor Instruction.

485. During the period of indoor instruction, plotting rooms will be improvised in the barracks or other convenient place, and manning parties for the plotting rooms and the substitutes will be kept in practice. During this period men will be selected for training in the duties of the plotting room and as observers, with a view to their future detail.

During this period telephones will be set up in the barracks, or other convenient place, and careful instruction in the operation and care of telephones will be given to as many selected men as practicable.

The period of indoor instruction will be utilized for the instruction of gunner candidates, but this will not be permitted to interfere with keeping plotting-room details and telephone operators in practice. The duty of keeping the members of plotting-room details for fire and battle commander's stations in practice during the period of indoor instruction devolves upon company commanders.

Weekly Artillery Inspection.

486. Weather permitting, battery commanders will every Friday make a complete inspection of their batteries.

This inspection will include a test of the position-finding system, using a moving target for vessel tracking when practicable.

Monthly Artillery Inspection.

487. The monthly artillery inspection will be conducted so as to include the following at each battery:

(*a*) Condition of position finding stations.
(*b*) Condition of emplacements and ground in their vicinity.
(*c*) Condition of galleries and magazines.

(*d*) Condition of doors.
(*e*) Condition of drains.
(*f*) Condition of hoists, guns, and carriages.
(*g*) Condition of electric and other lights.
(*h*) Condition of electric installation and power plants.

To accomplish this inspection at gun emplacements, the trolleys and ammunition hoists for each gun will be tested by transferring two rounds of dummy ammunition from the magazine to the loading platform. At mortar emplacements four rounds for each pit, one for each mortar, will be so transferred.

All doors will be opened and closed, except those of rooms containing powder, which will not be opened if the meteorological conditions show that condensation will take place therein.

In preparing guns, mortars, and their carriages for inspection the oil will not be removed from bearing surfaces.

The filling plugs of recoil cylinders will be removed. Particular attention will be paid to the lubrication of all bearing surfaces and to the adjustment of the mushroom head. As the inspector passes plugs will be replaced. At gun emplacements carriages will be traversed between stops. Mortars will be traversed the full circumference of a circle. Guns and mortars will be elevated and depressed to their limits. Guns on disappearing carriages will be tripped.

At batteries in service the companies will be exercised in serving the guns and mortars with dummy ammunition, tripping guns, and simulating fire at a moving target, including all details of position finding and the application of corrections for range and deflection. Power plants and lights in magazines, on loading platforms, and on carriages will be in operation during the inspection.

The time of serving ammunition and the time for simulated loading and firing one round from each gun and one salvo from each mortar pit in service will be published to the command. The latter time will begin at the command *load* with the ammunition on the truck at the point where it is delivered on the loading platform or at the mortar pit.

To avoid injury by undue twisting of the electric wires, mortars will not be continuously traversed in the same direction more than a full circle.

All material, both in and out of service, will be included in this inspection; monthly artillery inspections may take as many days as necessary during the last days of the month.

During this inspection a moving target will be provided for each battery, if there is one under the control of the commanding officer.

Material Out of Service.

488. Gun and mortar emplacements to which no manning party is assigned are *out of service.* Each 10-inch and 12-inch gun emplacement, every two 6-inch and two 8-inch gun emplacements, each rapid-fire battery of guns less than 6-inch in caliber and each mortar emplacement, out of service, will have assigned to it a cleaner, who will be on special duty under the officer responsible for the emplacement. The ordnance officer will be responsible for entire batteries out of service. Battery commanders are responsible for emplacements of their batteries out of service.

The ordnance officer will be responsible that the batteries out of service are kept in serviceable condition (i. e., prepared for service on not more than twenty-four hours' notice), and battery commanders will be similarly responsible for emplacements of their batteries out of service, but no attempt will be made to drill at any armament while it is out of service. The duty of caring for the armament out of service will be performed as far as practicable by the authorized cleaners. When necessary to employ additional men they should be detailed as far as practicable from those men who have not qualified as gunners.

Position-finding stations to which no manning party is assigned are *out of service,* and will, together with the batteries out of service, be carefully inspected each week by the ordnance officer, who will be furnished the necessary detail for moving carriages, including the tripping of disappearing carriages, operating loaded hoists, etc. The post artillery engineer will inspect all searchlights and electric plants, and also electric communications connecting position finders and batteries out of service, at least once each week, and will be furnished a sufficient detail to give the system a practical test.

At posts where torpedo companies are stationed, at least one mining casemate will be maintained constantly in service, and at least one group of three mines (not loaded) be kept planted for the purpose of observation and test.

The Detail of Manning Parties for Material in Service.

489. When the artillery district commander attends artillery drill as a battle commander or as a fire commander, artillery district staff officers will act as officer in charge of communications and searchlight officer. In time of peace an officer will not be detailed as assistant battle or fire commander, except during joint exercises.

490. Battle and fire commanders will not detail communication officers at their stations during drill if such detail will reduce the number of officers present with any company to less than two. If no officer is available, a suitable noncommissioned officer will be detailed to act as communication officer during drill.

491. The enlisted members of manning parties for battle and fire commander's stations will be detailed by company commanders in obedience to instructions from the battle and fire commanders from the instructed observers, plotters, readers, and operators of their companies. Such details will be reported by company commanders to the adjutant.

492. A permanent manning table of the enlisted force for the armament and its accessories in service will be made out in the following order of precedence and always kept up to date:

In each battle command—
- (*a*) A complete manning party (one relief) for the battle commander's station.
- (*b*) A complete manning party (one relief) for the searchlights of the battle command.

In each fire command—
- A complete manning party (one relief) for the fire commander's station.

For each storage battery, power plant, or signal station—
- A complete manning party (one relief).

For each battery range section—
- A complete manning party (one relief).

For each gun section—
- A complete manning party.

In each mine command—
- A complete manning party (one relief) for the (*a*) range section; (*b*) power section; (*c*) planting section; (*d*) loading section; (*e*) rapid-fire gun section assigned to the defense of the mine field.

493. The gun detachments of 6-inch rapid-fire guns will have two trained gunners, and the gun detachments of smaller rapid-fire guns will have three trained gunners detailed in the permanent manning table.

494. A manning table will be posted in each primary station showing the names, rank, company, and duty of the men assigned to each position in the manning party for that station. This table will also contain a list of all the instructed substitutes for each position.

495. Company commanders are expected to keep two men trained for each position in the manning party of battle and fire commander's stations for which their companies furnish details, and two men for each position in the range section of the battery to which their companies are assigned.

Special Duty Details for Material in Service.

496. The authorized gun commanders will be permanently appointed by selection from the sergeants by the battery commander.

They will have the charge and care of the guns and emplacements at all times both during and after drill hours.

The following gun commanders for pieces in service will be excused from guard and fatigue:

One for each 8-inch, 10-inch, or 12-inch rifle;
One for each mortar pit;
One for each 6-inch disappearing gun;
One for every two 6-inch guns on pedestal mounts;
One for every battery of two or more rapid-fire guns of smaller caliber.

497. There shall be designated by the commander of a torpedo company a loading-room sergeant and a casemate electrician, who shall have duties and privileges conforming to those of gun commanders. Torpedo companies shall be entitled to gun commanders only for the guns of a mine command for which the company can furnish the necessary men.

498. One observer (to be selected from noncommissioned officers, or privates of proved skill) will be permanently detailed by the battery commander for each position-finder station of the battery, and one observer will be similarly detailed for each battle, fire, and mine commander's position finder.

499. One mechanic, or acting mechanic, will be assigned, under the gun commander, to each 8-inch, 10-inch, and 12-inch gun and mortar emplacement in service. He will be in immediate charge of all property, small stores, and supplies at the emplacement.

500. To enable them to properly perform their duties, gun commanders, observers, plotters, and mechanics will, except during the period of indoor instruction, be excused from guard and fatigue.

Additional Details for Drill and Target Practice.

501. When a boat is available for vessèl tracking an officer will be detailed monthly as range observer (provided the number of officers with any company is not reduced to less than two), and with a working detail of one noncommissioned officer and a suitable number of privates will accompany the tug whenever the target is towed. If no officer is available, a noncommissioned officer will be detailed as range observer at drill.

On all occasions of target practice the range observer on the tug will be an officer not belonging to a company practicing.

The Daily Routine.

502. Fire commanders will go to their respective stations after the sounding of the assembly for the artillery drill or practice and will remain there until the communications are tested and found in working order, or until it has been ascertained that the lines are not in order. In the latter case they will give instructions for the necessary repairs.

503. Suitable boats being available, a target will be towed, weather permitting, at battery drill at least one day each week. When a target is towed the same rules will be observed with respect to signals during drill as govern during practice, and the same care will be exercised in applying them.

504. At artillery drill when a target is towed, or a vessel is available for tracking, its use for observation and plotting purposes will be utilized to as great an extent as practicable.

505. Only the crew of the tug and the officers and men detailed for duty aboard her will be permitted there during drill or practice, day or night, except by special permission from the commanding officer.

506. On the days of battery drill the details in battle and fire commander's stations will practice vessel tracking.

507. One day in the first week of each month the time-interval bells will be cut off and observations taken from a watch or clock in the primary station; *ready, take,* being called over the telephone to the secondary station.

508. In order that observers may change, quickly and without confusion, from one system of position finding to another, the following practice is prescribed for at least one drill each week: When the target, during either day or night drill, is beyond a certain range to be fixed in orders by the artillery district commander, from the primary station, depending upon local conditions, the H. P. F. system will be used, and for a less range, the D. P. F. system will be resorted to.

509. One day of each week, to be announced in post orders, noncommissioned officers and privates of companies assigned to rapid-fire guns, who are gunners, will be instructed in their batteries in the principles of sighting and tested in aiming, with the view of ascertaining who are the best qualified gun-pointers. This exercise will be at any two stationary objects in the field of fire not separated by a traverse of more than 30 degrees.

The officer gives the command: *At such an object* (defining the object), *range — yards,* or *elevation — degrees — minutes; deflection right* (or left) *— hundredths of a degree. AIM.*

The sight, being at zero for elevation and deflection, will be adjusted at the command *AIM.* As soon as the gun is aimed the gun-pointer calls out *SET.* Time is taken from to *AIM* to *SET.* The aim will be either at the water line of fixed objects, or at any point selected on them. The aiming will be in series of five trials each, and a record will be kept by each company commander in order that the best-qualified aimers, regardless of rank, may act as gun-pointers during subcaliber and artillery practice. The officer will first note if the sight be properly adjusted and afterward if the aim is correct. If the sight be properly adjusted and the gun correctly aimed, the marking will be 10 if completed in fifteen seconds. For each delay of five seconds, or fraction thereof, 2 will be deducted from the total mark of 10. The gun will be aimed at a different target at each command *AIM;* the range, or elevation, and the deflection will always be changed after each trial. If the sight be adjusted to a range or deflection other than the one ordered, the mark for that test will be 0.

After the completion of the aiming tests at fixed objects, practice will be had at aiming and simulating fire at moving objects. Immediately before the simulated firing begins the gun-pointer will make a deflection correction for the movement of the target during the time of flight. To do this he sets the index of the deflection scale at 0, traverses the gun until the line of sight is a little in front of some point of the target and stops traversing; when the selected point comes on the line of sight he keeps it there during the time of flight by turning the deflection screw. He then observes the reading of the deflection scale and sets to the corresponding division on the opposite side of 0. With telescopic sights the inside scale will be used.

The time of flight to the nearest second will be given by the gun commander and the gun-pointer will measure time by counting.

The gun-pointer will set his sight for elevation and follow the target, keeping the gun aimed continuously as far as practicable. During artillery practice he will observe the splash of his shots and, when firing at will, change the deflection to correct for lateral deviation and the elevation to correspond to the changing range of the target.

When ready to fire, the gun-pointer will traverse the piece so that the vertical hair is on the bow of the target, halt the piece, water line the target, and when the point to be attacked crosses the vertical hair, will fire the piece or give the command *FIRE.*

510. On one day of each week actual firing will be simulated as closely as possible.

For mortars.—The battery commander will be assisted by an officer, or by an intelligent noncommissioned officer, equipped with a stop watch reading to fifths of a second and a time-of-flight scale, also reading to fifths of a second. As prescribed in position-finding service for a mortar battery, the range and azimuth of a predicted point are sent to the battery commander, who sets his instrument to the azimuth of the *predicted point,* the vertical hair at 3°. As the target passes the vertical cross hair of his instrument, he commands *FIRE,* when the assistant starts the stop watch. Having noted the time of flight corresponding to the zone and range received, the assistant calls *halt* at the expiration of the time flight indicated in the table. The battery commander, after commanding *fire*, continues to follow the target with the movable cross hair by means of the deflection screw. He stops the motion of the cross hair at the signal *halt.* The azimuth of the target at the expiration of the time of flight is determined as follows: Add the micrometer reading to the azimuth of the predicted point and subtract 3°. The result is the azimuth required. By comparing the azimuth thus obtained with the azimuth of the set-forward point from the battery commander's station, the angular measure of the error in prediction can be obtained.

Example 1.—Sixth zone; range to predicted point, 6,550 yards; time of flight, 38⅗ seconds; azimuth of predicted point, 217.40°; azimuth of set-forward point, 220.11°; reading of the deflection scale, 5.81°.

Azimuth of predicted point	217.40°
Micrometer reading	5.81
	223.21
Subtract	3.00
Azimuth of target	220.21
Azimuth set-forward point	220.11
Error in prediction	0.10

At ranges beyond 9,000 yards, in many cases the movable cross hair can not be used, as the target will pass out of the field of the telescope. In such cases the target must be followed with the telescope, and the azimuth at the expiration of the time of flight read directly from the instrument.

The difference between the azimuth of the set-forward point and the reading thus obtained is the error in prediction.

When the target can not be seen from the battery commander's station, the range and azimuth of the predicted point from the primary station will be sent to the range officer, who will perform the duties prescribed for the battery commander.

For guns.—In order to avoid the necessity for keeping accurate record of the varying deflection for wind and drift when using a moving target, a constant deflection will be used during the drill. assumed as the algebraic sum of the deflections due to wind and drift. The same *constant deflection* may be used during the entire drill, or for a certain number of shots. To accomplish this the platen of the deflection board will be set for a certain deflection on the deflection scale, and the setting will not be changed so long as the same *constant deflection* is used.

Case III.—The range officer predicts as prescribed in position-finding service and signals *fire* as the target passes his vertical cross hair, The guns are laid at the corrected set-forward azimuth as prescribed for guns, using a *constant deflection* for wind and drift.

The sight is used on the sight standard and the gun-pointer follows the target with the vertical cross hair as soon as it enters the field of the telescope, if not already there.

The range-keeper at each emplacement, equipped with a stop watch and time-of-flight table, starts his stop watch at the signal *fire,* and stops it and calls out *halt* at the expiration of the time of flight for the given range.

The gun-pointer stops the motion of his cross hair at the signal *halt.*

Subtract the constant deflection from the reading of the outside deflection scale of the sight and the difference will be the angular measure of error in prediction and laying.

On the occasion of at least one simulated firing drill each month Case III for guns will be used, and the fact that it was used will be noted on the report for the week during which it was used.

Case II.—The chief of detachment uses the watch and the time-of-flight table. The gun-pointer sets his sight at the deflection received from the primary station, which is the deflection obtained from the deflection board by combining the correction for angular travel during the time of flight with the *constant deflection* for wind and drift. He traverses the gun slightly in advance of the target, stops it, and commands: 1. *No.* —, 2. ***FIRE***, as the target passes his vertical cross hair; he then follows the target with the vertical hair. The range-keeper starts the watch at the command ***FIRE***, and calls out *halt* and stops the watch at the expiration of the time of flight. The gun-pointer stops the motion of the vertical hair at the command *halt.*

Substract the constant deflection from the reading of the outside deflection scale of the sight and the difference will be the angular measure of error in prediction and pointing.

Example.—Constant deflection, 4°, reading of the scale, 3.80°. $3.80^\circ - 4.00^\circ = -.20$. The deflection on the sight was 0.20° too small, or the gun-pointer's pointing was out 0.20°.

The data obtained at the guns will be recorded and sent to the primary station for computation and comparison after the drill.

Report of this practice will be submitted each Friday by each battery commander through his fire commander on the proper form.

The error obtained by the above methods, unless it can be shown to be due to the mistake of a particular man, is the measure of accuracy of the team practice of the battery, including observation, plotting, predicting, use of difference charts, and laying or pointing.

The method of obtaining deflection prescribed in pars. 234 and 235 will also be practiced during this drill.

511. On one day in each month a drill will be had in the necessary precautions to be used for safety in target practice. If at any time the range would not be safe for artillery practice, the officer in charge of the drill will command in a loud voice, ***CEASE FIRING.*** The service of the piece will be continued, and the command ***TIME OUT*** will be given at the moment that the piece would have been fired in artillery practice if the range were safe. As soon as the range is again safe, the command ***COMMENCE FIRING*** will be given and the piece will be fired, but the *time in* will not begin to run until the command ***FIRE*** is given. At drill the senior officer present will decide when the range is safe.

512. Once a month battery commanders will test the observers as to their proficiency. The method of training observers and the standard of proficiency is prescribed in position-finding service.

Precautions for Safety During Artillery Practice.

513. The fire commander is responsible for all necessary and usual precautions as to safety during firing.

He should have an assistant to watch the field of fire, who will notify him of any apparent danger.

514. Artillery practice at any particular battery will always be preceded by careful instruction in its service.

No man will be detailed to a position at the practice for which he has not been instructed at a reasonable number of drills immediately preceding the practice.

515. After a missfire the breech will not be opened nor the primer unseated for ten minutes.

516. During target practice no flag or signal will be displayed at any battery on shore, except at the firing point or at some other point of which the range observing party on the tug has had previous notice.

517. The battery commander will personally inspect the recoil system immediately before any firing to see that it is in proper condition.

Attendance at Artillery Practice.

518. The artillery district commander will in all cases be present and exercise general supervision.

519. When the exercises connected with artillery practice commence, all other instruction for the companies engaged will be suspended.

520. No officer or enlisted man will be excused from the practice of his company except when, in the judgment of the post commander, the necessities of the service preclude such attendance. In all such cases the commanding officer will report his action with, reasons therefor, to the artillery district commander. Every effort to have the greatest possible percentage of the company firing present at the battery will be made. This percentage will be reported on the proper form.

521. Details for the guard for the day should be furnished, if practicable, from companies not firing.

522. All officers and enlisted men belonging to the fire command of the battery firing not needed for duty elsewhere in connection with the practice will be present and at their proper stations on all occasions of practice. The fire commander will take position in the fire commander's station if therefrom he can personally view the field of fire.

Care and Handling of Powder Charges.

523. The careful study and observance of all regulations, orders, and circulars relating to the care, handling, and use of powder is enjoined upon all coast artillery officers.

524. The velocity assumed for each charge and any reduction of powder made, together with the reasons therefor, will be reported to the artillery district commander.

525. In any case in which poor practice is believed to have been caused by defective powder, a special detailed report will be made immediately to the Chief of Ordnance through military channels.

526. Prior to artillary practice, the bore, including the powder chamber, of each piece to be used in practice will be thoroughly cleaned and freed from grease and oil before any shot is fired.

527. All powder to be used for target practice at any battery will be stored in the service magazines of the guns in which it is to be used for at least two weeks before the trial shots are fired.

and no charge will be delivered on the loading platform until the piece is to be loaded. Powder of the same lot will be used for each series, including trial shots; when this can not be done with the powder on hand, report of this fact will be made to the Chief of Ordnance, direct, through the Chief of Artillery.

After being stored in a magazine for two weeks the temperature of the magazine may be taken as the temperature of the powder without material error. The temperature of a magazine should be taken immediately upon opening the doors, or without opening the doors if possible. It will be taken at the beginning of each series of practice and reported on the proper form.

Reports.

528. Before any firing begins, and immediately after its termination, the battery commander will inspect the pieces, carriages, platforms, implements, equipments, and accessories, and will, after the practice, make written reports on their condition to the artillery district commander, through the tactical chain of command (including fort commander). These reports will be separate on matters affecting each supply department concerned, and on those affecting the drill. Pertinent recommendations which the practice or preceding drill and instruction may have suggested for the improvement of the material or the drill will be encouraged by artillery district commanders. If there are no defects to be reported or no suggestions to be made affecting any or all the staff departments concerned, or affecting the material or drill, a single report embodying that statement will be sufficient. These reports will be forwarded by the artillery district commander only in cases requiring action of higher authority.

Each company commander will submit the reports upon the practice of his company, for the prompt rendition and accuracy of which he will be held responsible; either he or his officers will verify the final plotting of the shots from the data furnished by the observers.

All data called for by the prescribed blanks must be noted, or any omissions explained.

Before forwarding the record of artillery practice, the fort commander will see that all necessary data from it are entered in the post book of artillery record.

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